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RECENT ADVANCES IN ROENTGEN RAY METHODS

BY SIR JAMES MACKENZIE DAVIDSON, M.B. C.M.

Consulting Radiologist to the Military Hospitals in the London District

LONDON, ENGLAND

THE war has brought home even to the least observant the enormous utility of roentgen-rays when properly applied. The essentials of proper application under military conditions are, in the first place, standardization of apparatus, and, in the second, instruction of operators. It is a matter of great satisfaction to the writer to find that the American army is proceeding upon such excellent lines in both these respects. Their field apparatus embodies the new Coolidge tube of the "Radiator" type, which possesses such marked advantages for use with portable sets in field work. Thus they have an instrumentation which is at once reliable and convenient. The introduction of the Coolidge tube has entirely revolutionized roentgen-ray work, and has opened up a number of fresh possibilities. The gas tubes, however good they may be in themselves, can in no way compete with it, either from the point of view of efficiency or durability, and seeing that the tube is the most crucial and very often the weakest point in the roentgen-ray outfit, it is a pleasure for us over here to observe with what characteristic resolution and thoroughness American engineering has tackled the problem.

In the second respect, that of teaching the operator, the American method again sets us all a good example. The establishment of teaching centers for roentgen-ray medical officers is an admirable policy, and it would be well if our British War Office had adopted a similar course of action: but "better late than never." We in England have recently formed a "*British Association of Radiology and Physiotherapy*," whose object is to ensure proper teaching for roentgen-ray workers. It is hoped before long to have not only excellent teaching centers established in London, and possibly also in the provinces, but to enable the student to obtain the Cambridge Diploma, in the matter of which the University has been most helpful and sympathetic. This movement ought to attract many workers from the Colonies, and possibly also from the United States. One aim of the Society will be to try to arrange for the education and regulation of lay assistants, a matter of great importance in view of the unfortunate encroachments which have been made upon purely medical domains. It goes without saying that the work of lay assistants must be carried out under a system of the most complete control and supervision by properly qualified medical men. It is also proposed to establish a central institute for post-graduate teaching, arranging for the various hospitals

to coöperate in the scheme. This ought to be welcomed by our visitors from overseas.

Apparatus for Rapid Localization.—War conditions have also emphasized the need for speed in *x*-ray examination, though never at the cost of precision, and the extreme importance of exact localization of foreign bodies on the screen. The use of the screen for rapid diagnosis at the front seems to be essential, as it often happens that there is not time to take roentgenograms: though it must never be lost sight of that a good negative is enormously superior to any shadow on the screen, however good the latter may be. It seemed advisable, therefore, to construct an apparatus which, while enabling the most precise localization of foreign bodies to be carried out, should yet be so simple that any ordinary roentgen-ray worker could be rapidly instructed in its use and be able in a short time to produce results for the surgeon. The apparatus which the writer has devised for this purpose consists in the first place of a couch or an ordinary army stretcher with a roentgen-ray tube supported below, the latter being surrounded by a protective shield or contained in a lead-lined box. By means of two arms which are carried outside the tube-box through a zigzag opening, the tube can be raised and lowered easily. These arms are attached to an upright supporting pillar from the upper part of which is carried a hinged horizontal piece projecting over the couch by a rack-and-pinion arrangement moving in exact conformity with the tube below, so that the distance between them is constant. At the end of this horizontal piece is a square frame holding a hinged fluorescent screen together with the cross-wire device, the wires intersecting exactly above the spot on the anticathode of the tube at which the rays originate.

To use this apparatus, the tube is first roughly adjusted to the required position, and the final centering is done by suspending a small plumb-bob from the intersection of the wires. The screen is then closed down upon the wires, with the plumb-bob hanging two or three inches below, and when the tube is excited, the circular shadow of the plumb-bob is observed. By the turn of a screw the point of intersection and the center of the shadow of the plumb-bob are brought into relation, and when this has been done the adjustment is perfect, and the tightening of a clamp makes displacement impossible. In order to locate the foreign body, the patient is placed in position, and the operator, holding the handles of the two arms already described, moves the tube-box underneath backwards and forwards and across, so that the patient can be examined if necessary from head to foot. When the foreign body is detected, the apparatus is carefully adjusted until the shadow of this foreign body coincides with the intersection of the cross-wires, whereupon the tube-box is clamped, the screen hinged back, and the patient marked at the point of intersection, vertically below which, of course, the foreign body is lying.

It remains to ascertain the depth of the foreign body below the surface, and the manipulation in this case is as simple as in the other. The screen is replaced; the upright T-piece is rotated counter-clockwise, and the tube-box and support are thereupon displaced to the left, to the precise distance of 6 cm., thus causing the shadow of the foreign body, which had been previously accurately centered, to be displaced to the right of the intersection. As the distance between the tube and the cross-wires is always known and constant (*e.g.*, 50 cm.), the displacement of the shadow varies with the depth and can easily be calibrated. To measure the amount of displacement, a very fine micrometer wire is made to travel across the screen horizontally, parallel with one of the fixed cross-wires, by being attached to the nut of a two-thread screw. When the position of this wire corresponds with that of the displaced shadow of the foreign body (or with that part of it which was originally centered by the cross-wires), an

arrow-head indicator on a calibrated scale furnishes automatically the depth of the foreign body, that is to say, the distance of the foreign body from the cross-wires on the supporting frame. It should be added that it is quite a simple matter to arrange this apparatus for photography, either for the single picture or the stereoscopic pair. The point where the wires intersect indicates the vertical ray, and this being directly over the area which is to be photographed, a little mark can be made on the skin vertically below the cross-wires, the horizontal arm in its entirety then swung back, the plate in its holder placed as usual in this position on the patient's skin, and the exposure made, together with a second exposure after the tube shift.

Proposed Localizing Stand for Working with the Tube in Three Positions.—In order still further to simplify and "mobilize" this method of localization, the author proposes constructing a tube-and-screen stand, which shall move on castors so as to permit of ready manœuvre in any relation to the couch. This stand will have near its base an arm carrying the tube, and from its upper part will project another arm carrying cross-wires and screen. These two horizontal pieces will always be a fixed distance apart, and can be raised or lowered conjointly as required. The procedure of getting the shadow of the foreign body in the center of the cross-wires and marking the patient's skin at that point is carried out in the ordinary way. However, an arrangement will be incorporated in this mechanism by which the arm carrying the tube can be swung to one side like a pendulum, still maintaining a fixed distance from the other arm holding the screen. When this is done, the shadow on the screen is, of course, correspondingly shifted in the opposite direction, and by means of the calibrated indicator, the depth is ascertained forthwith. The advantage of this pendulum action is that the tube, in being shifted to one side, is moved not linearly but along the arc of a circle, so that if a fine stop is in front of the tube the central ray can be directed through the center of the aperture.

A stand of this kind has the additional recommendation that the tube can be swung further, even to an angle of 90 degrees, occupying a vertical instead of a horizontal position in relation to the central pillar, and the arm holding the screen is, of course, swung at the same time and by the same movement. This furnishes all the arrangement necessary for examining the patient in the upright position. It is even possible to carry this principle still further, and to swing the tube another 90 degrees, so that it then occupies a position *above* the screen-supporting apparatus instead of, as formerly, below it, thereby permitting the work to be done from above instead of from beneath. In this way the stand, if properly made, with a good solid bearing for the arm support, can be used for working at will with the tube below the patient, at the side of the patient, or above the patient—all by the simple rotation of the tube support.

One of the chief advantages of a stand of this kind is that it could not only be used for a patient on a stretcher or for a patient sitting up, but could also be used under an operating couch, and the surgeon could at any moment, by viewing through a hood or by darkening the room for a while, ascertain the exact position and depth of the foreign body as measured from any instrument he chose to introduce into the wound. The observing screen need never touch the wound, so that no question of disinfection could arise, and the accuracy of the measurements is not influenced in any way by the distance of the wound from the screen. Simplicity in procedure and extreme accuracy in result are the two desiderata in any roentgen-ray method for dealing with war casualties, and the writer believes that these have been achieved in the method he has indicated. However lengthy and tedious the procedure may appear in description, it is a matter of only one or two mechanical adjustments in actual practice, and occupies but a few seconds.

THE "PENETRATING-IRRADIATIONS-SICKNESS"*

BY A. BÉCLÈRE, M.D.

Academy of Medicine

PARIS, FRANCE.

IN admitting me to its list of honorary members, The American Roentgen Ray Society has bestowed upon me a favor of whose worth I am keenly appreciative, and for which I am most grateful. I am sending this paper as a modest testimony of my gratitude, and to show its members with what interest I am following their productions.

The war, while it has more firmly bound together the ancient bonds of friendship and of fraternity of arms between the United States and France, has at the same time revived the warm union between the radiologists of the two countries. As a matter of fact I read THE AMERICAN JOURNAL OF ROENTGENOLOGY with great pleasure; and it was with equal delight that I had an opportunity recently of seeing in Paris its editors, my excellent friends Colonel Case and Major Hickey, and of admiring the remarkable activity that they are displaying in the organization and the direction of the roentgenological service of the American army on French soil.

In the JOURNAL of last January I read with a very special interest the article written by my friend Dr. Pfahler on "The Cause and Prevention of the Constitutional Effects Associated with the Massive Doses of Deep Roentgenotherapy," and also the article on the same subject by Doctors Llewellyn Jones and Paul Roth based upon experimental researches inspired by Dr. Case. These two papers have suggested some thoughts to me which I wish to present to the American Roentgen Ray Society.

The group of more or less disagreeable disturbances which sometimes follow sessions of roentgenotherapy constitute a morbid picture—a syndrome—which deserves to be called by a special name. The German authors call it "*Roentgenkater*." The German word "kater" means "the disturbance which follows an excessive amount of wine or beer." Without doubt they found some analogy between this type of upset and the disagreeable syndrome sometimes provoked by roentgenotherapy.

The morbid state in question is not provoked by the therapeutic use of the roentgen rays alone, but also by the use of the salts of radium and of other radio-active substances. In the latter case the German authors call it "*Radiumrausch*," which means literally "a drunkenness from radium," and makes a very worthy addition to "*Roentgenkater*."

Professor Sebastian Recasens of Madrid and Dr. Victor Conill of Barcelona, in their work "Radioaterpia profunda y Radiumaterpia in Ginecologia," do not accept the terms employed in Germany, and the reasons for their refusal are very interesting.

The proverbial sobriety of their countrymen is the reason, they say, why there is no equivalent in the Spanish language, rich as it is, for the German word "*Kater*"; and they do not wish to inflict a barbarism on this harmonious language. Besides, the comparison between the disturbances which follow an excess of liquors and those which are produced by roentgenotherapy appears to them not only inexact, but also discourteous to the sick people who are thus afflicted.

They therefore call the language of Hippocrates to their aid, and with the Greek word "*aterpòs*" (disagreeable) they manufacture the new words "*roentgena-*

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terpia" and "*radiumaterpia*," which they use in opposition to the "*Roentgenkater*" and "*Radiumrausch*" of the Germans.

In preference to this word "*aterpie*," whose sound is too similar to "*therapie*," and in order to avoid confusion, may I be permitted to propose a new term, The "*Penetrating-Irradiations-Sickness*" (Le mal des irradiations penetrantes).

This term, if it were adopted, would have the advantage of uniting and including together the disturbances caused by roentgenotherapy and by radiotherapy. Likewise, without attempting in any way to presume the intimate mechanism, still obscure, of the morbid state in question, it would bring to mind another universally known disturbance to which it bears, I think, much closer resemblance than to drunkenness or the effects of excessive drinking; I refer to "*sea-sickness*" (mal de mer).

Although it is not necessary here to enter into a detailed discussion of its multiple elements and of its various degrees of intensity, it may be stated that the syndrome in question consists essentially, just as does sea-sickness, in a general malaise, characterized chiefly by a state of nausea, which sometimes ends in vomiting, and sometimes does not.

In attempting to solve the problem of the etiology of this mysterious syndrome, it is not improper to take into consideration all the possible sources of information; the data of normal and of pathological physiology; the clinical observation of the sick people; and the results of animal experimentation.

Anatomo-physiological data.—What are the teachings of physiology with regard to this condition?

We know that vomiting is an involuntary movement, a reflex act, whose center is in the medulla. We know also that the centripetal excitation of this reflex arrives sometimes by a nervous path, over the sensory nerves, when their periphery undergoes some irritation; and sometimes through the vascular system, when the arterial blood is loaded with substances such as tartar emetic. This was the condition in the old and famous experiment of Magendie, who provoked vomiting in the dog by an injection of this emetic into the veins. The action of apomorphine is also similar, although of much more recent discovery.

Among these substances, known as emetics, whose introduction into the bloodstream, by whatever route, provokes the state of nausea and vomiting, there may be classed nicotine. This classification seems logical because the disturbance brought about in the novice by the inhalation of tobacco smoke presents a striking resemblance to sea-sickness, and to the disease studied in this paper.

With regard to the vomiting succeeding an excitation of the nervous system, all sensory nerves do not seem to provoke this reflex with equal promptness.

Among the cranial nerves, more particularly among the nerves of special sense, the reflex is produced very easily, and in the following order of frequency: the nerves of smell, taste and sight; that is the olfactory nerves, the glosso-pharyngeal, the chorda tympani, and the optic.

Thus we speak commonly of nauseating odors, of nauseating flavors, and of nauseating spectacles; yet we never speak of nauseating sounds or noises. At the same time, it must be remembered that in the labyrinth of the internal ear, certain lesions of the auditory nerve may produce a combination of disturbances, the syndrome of Ménière, in which vertigo, the nauseous state and vomiting play a prominent part.

On the other hand the general sensory nerve such as the trigeminal and the peripheral branches of the spinal nerves, produce vomiting only exceptionally. The sharpest neuralgia, either facial or sciatic, or the most violent attack of gout is hardly ever accompanied by a nauseous state. However, a slight blow against the inner portion of the olecranon, on the ulnar nerve, may be enough to produce in addi-

tion to the ordinary feeling of pain, another special sensation of being "sick in the stomach."

The nerves which govern the obscure and complicated sensibility of the viscera, are very frequently the paths over which travel excitations towards vomiting. These are the centripetal fibres, which are very closely united and anastomosed partly to the vagus system, which supplies sensibility to the heart, the respiratory apparatus, and to a large part of the digestive tract; and partly to the great sympathetic system, whose domain covers all the viscera, from the pharynx to the pelvic organs.

From the pathological point of view, we know how frequently a more or less painful and often unconscious irritation of the mucous membrane of the pharynx, the stomach or the intestine, the passage of a stone through the biliary or urinary tracts, or the presence of a foreign body in the uterine cavity may be the basis for the production of this reflex.

From the physiological point of view, we know how frequently pregnancy, especially in its early stages, is accompanied by nausea and vomiting. This symptom, although it may be regarded as normal when it is moderate, can become under certain circumstances, by its persistency and intensity, one of the most serious complications of pregnancy.

Although this nauseous state of pregnancy constitutes an essentially physiological condition, seen daily among many young and healthy women, its mechanism is by no means clearly understood. Writers are not at all in agreement. While some believe the bulbar excitation is of nervous origin, produced by irritation of the sensory nerves in the uterus, others maintain it is of vascular origin, and is the result of a true chemical intoxication, not very clearly defined, the autointoxication of the gravid.

In concluding this short review of the anatomo-physiological data which furnish a comparison of the more common nauseous states, I will mention a phenomenon which it is important to bear in mind.

Every nauseous state, whether produced from the uterus, the stomach or elsewhere, manifests itself, among other symptoms, by an extraordinary hypersensibility of smell, so that the slightest bad odor, although only barely perceptible, may be enough to precipitate an attack of vomiting which up to that time had only been threatening. Under these conditions it is not rare that the patient, ignorant of the primary cause of his trouble, should attribute it to an odor, when the physician can only consider the latter as an accessory or secondary cause.

In seasickness particularly, the chief cause is the rocking of the body produced by the oscillations of the boat. Disagreeable odors—especially those from fish, and, since the invention of steamboats, those from the engines—only constitute an exciting cause in the production of the vomiting. In spite of its secondary character, however, among very nervous subjects this cause may assume such an importance that even when on terra firma an odor of sea-fish may be enough to evoke the first symptoms of sea-sickness.

Clinical Data.—The mere clinical observation of these patients will not by any means be sufficient to solve the causal problem. We will gain some very valuable information, however, if we set about making our observations precise and detailed—without any preconceived bias—noting with care the conditions inherent in the patient himself: age, sex, constitution, state of nutrition and strength, mental and physical states, functional conditions of the various organs, the disease treated, the region irradiated, the sensations experienced in the course of the treatment, the time of appearance of the first trouble, the character, evolution and duration of the symptoms, etc.; likewise the various extrinsic conditions, the choice and penetrative power of the therapeutic rays, the method of employment, the dose given, the duration and

the time of repetition of treatments, et cetera.

First of all in the interpretation of these phenomena it is important to note the psychic factor, as Dr. Pfahler has justly remarked. I mentioned the action of this factor in those hypersensitive people to whom the smell of sea-food or even the sight of a boat was enough to start an attack of "sea-sickness." It also certainly played a part with the patient mentioned by Dr. Pfahler who could never smell the odor of an automobile without having the same disturbance as after a treatment. One may even speak of autosuggestion in regard to that other patient, described by the same observer, who had only to cross the threshold of his physician's office, in order to feel all the disagreeable disturbances in question.

Aside from this psychic feature, the only other important factor in the room where roentgen irradiations are taking place is the air, which is subjected to many complicated changes unnecessary for me to recount here. It is sufficient to state that these alterations are manifested by a complex odor, in which that of *ozone* predominates. Most of the patients treated notice and pick out this odor; many of them complain of it strongly; some even blame it for all the sickness they feel during or after the treatments.

It is to the action of this odor, or more exactly to the inhalation of the noxious gases which produce the odor, that Dr. Pfahler attributes the chief cause (he does not say the only cause) of the "penetrating-irradiations-sickness." His various publications on this subject bear out this idea.

This opinion of Dr. Pfahler, which is very important because of the just authority of the author, doubtless contains some truth, as is proved by the following observation: from the moment that he set out to assure himself of the purity of the air in his treatment room, even though this was only imperfectly done, the proportion of patients affected with a reaction —which previously had been one in four— dropped to one in ten.

In spite of this good result, and without in the least detracting from the practical value of the rules which he follows, it may be stated that in this sickness, just as with sea-sickness, the inhalation of a vitiated or bad smelling air serves only as a secondary or accessory cause. We must still look for the primary cause, the only one which really deserves to be so considered.

With perfect good faith, Dr. Pfahler has reported an observation which contradicts his own opinion. This was the case of a woman with a fibroid of the uterus, in whom all the treatments provoked reactions, with the exception of the one in which he interposed a lead screen to absorb all the rays, without changing any of the other conditions of the apparatus. It is true that this experiment was unique and incomplete. The interposition of the lead screen took place only when the patient was cured, and during her last treatment. It would be very important to repeat this experiment with other patients equally predisposed to penetrating-irradiations-sickness, frequently alternating a fictitious with a real treatment, without the patient's knowledge.

Dr. Jones has already properly objected that the roentgenotherapeutist, his assistants, and all those who are present as mere spectators of the treatments, remain free from the reactions which are produced in the patients by the direct irradiations.

To this irrefutable objection I may add that the physician and his assistants are able to inhale with impunity, daily and for many hours each day, those gases whose inhalation for only a few minutes, and at long intervals, is said to be so noxious for the irradiated patients.

I will conclude with what I believe to be the chief argument. In a woman who has an organic disease of the uterus, treated by the introduction into the cavity of the uterus of a metallic holder containing some salts of radium or other radioactive

substances, we may observe exactly the same symptoms as with a woman subjected to the *x*-rays. This is decisive proof that it is not necessary to look for the true cause of the symptoms in the atmosphere of the treatment room, in the form of odor or of gas. They may be attributed solely to the penetrating irradiations themselves, whether in the form of roentgen rays or in the form of the gamma rays of radium.

Thus I believe that the title of the present paper is justified. Since we know today that the roentgen rays and the gamma rays of radium are of the same nature, and in proportion to their penetrative power have practically the same properties, their only real difference consisting in an inequality of wave-length—therefore a type of action which is demonstrated to occur with one should also exist with the other.

Limiting myself here to a discussion of the roentgen rays: By what mechanism of action are they able to affect deep-seated organs so as to produce the state of nausea and vomiting? There appear to be two hypotheses. Either they irritate the periphery of the sensory nervous system, or they provoke the passage into the blood-stream of soluble substances endowed with emetic properties.

Let us examine the first hypothesis. From the physiological point of view, the *x*-rays would appear to be incapable of affecting the organs of special sense, since in the normal individual who is exposed to their action no sensation occurs that he is able to notice. However, this rule appears to have some exceptions; and I am led to suspect that such is the case when there is a pathological condition present, such as a neuritis of the peripheral nerves, which makes them hypersensitive. I have had the opportunity of observing two persons, one a maker of instruments and the other a physician, both of whom had a chronic radiodermatitis of the fingers, which presented obstinate ulcers, very sensitive to the least touch. Whenever these diseased fingers were in a field of radiation from an *x*-ray tube they immediately became the seat of a very disagreeable pricking sensation, together with a feeling of crawling, which disappeared with the interruption of the radiation. In addition, I have been told that among the large number of wounded soldiers who have had limbs amputated and whose stumps have been roentgenographed, certain of them complain, during the exposure, of disagreeable, and even of painful sensations in the region radiated. I believe that if any roentgenologist would seriously devote himself to a really scientific study of this problem, he would not fail to make many interesting discoveries.

In the course of treatments, the region exposed is not as a rule the seat of any sensation. This rule, however, has some exceptions. Of the very few cases of this sort that I have seen, the following is the most striking: I had a young woman patient, whose left breast had been removed on account of cancer. The disease had recurred, and the entire precordial region was covered with numerous nodules, some in the skin and some in the subcutaneous tissues, the latter adherent both to the skin and to the ribs and adjacent rib-cartilages. The patient, who lived in Switzerland, was treated there regularly. It was during her trips to Paris that I treated her four times in the course of thirteen months. She was reasonable, courageous, knew her disease, and was willing to do everything to help cure it. Yet she really feared the courses of treatment more than she desired them—for each treatment, whether in Paris or in Switzerland, led invariably to painful symptoms which resembled both angina pectoris and a febrile chill. A short time after the beginning of the treatment the precordial region, which had been irradiated, became the seat of a very painful sense of constriction, which soon spread into both upper limbs in the form of tingling. The patient meanwhile felt a general sensation of cold, and one could see her teeth chatter. The appearance was very

much like that of a malarial chill, but there was no effect whatever on the temperature. All these phenomena gradually increased in intensity during the course of the treatment, which often had to be shortened or stopped when they became unbearable. The symptoms stopped almost at once after the irradiation.

This rare case shows without doubt that, under certain pathological conditions, the *x*-rays are capable of directly affecting the ganglionic sensory nervous system. Whether they affected the conducting nerves, or the nerve cells themselves, especially the ganglion cells of the cardiac plexus, is a question which I am unable to settle. In order to determine this problem, rather delicate animal experiments would be necessary.

In the case in question, the disturbances observed manifestly had their point of origin in a painful sensation localized in the region exposed to radiation. This condition, however, is not a necessary one. It is very possible for the *x*-rays to affect directly some plexus or ganglionic nervous system, deep down in the region exposed, without the patient having any sensation whatever. It is one of the properties of the nervous system to be endowed with acute sensibility, and very often, as pathology teaches us, a general disturbance such as the nauseous state, may be produced by a localized visceral irritation, of which the patient has no feeling and no knowledge.

In order that symptoms evoked by penetrating irradiations might be attributed legitimately to a direct impression upon the ganglionic nervous system, on the vagus or the sympathetic, it would be necessary for these symptoms to begin a short time after the commencement of the irradiation, and not last very long after it stopped. This was the case with the woman whom I reported above. On the other hand it is quite the contrary with the common observations where symptoms of nausea and vomiting, different from those in the patient above, appear only when the exposure is over, and even after a period of incubation, lasting several days, or even as long as several weeks. This would certainly not agree with the hypothesis of a direct action of the roentgen-rays on the nervous system.

We are now brought to the second hypothesis, that of the passage into the blood of certain soluble substances endowed with emetic properties.

Up to the present time no one has been able to find by chemical examination any foreign substances in the blood of patients exposed to deep radiations.

The contention of Dr. Lange that the trouble was due to an excess of acidity in the blood appears to have no confirmation, since the researches of Doctors Llewellyn Jones and Paul Roth, based on the study of carbonic acid in the expired air, showed that there was not the slightest sign of acidosis after courses of roentgenotherapy. They even found that in cases where some acidosis existed prior to the treatments, that the latter did not produce any increase.

Judging merely from the observation of the time of the appearance of the symptoms and the time of their termination, and noting the more or less degree of delay in their starting as compared with the end of the session of treatment, one is forced to believe that the radiation has provoked the formation of emetic substances, whose passage into the blood is not instantaneous but gradual, and whose elimination by the renal filter requires a certain length of time.

This hypothesis appears more probable when we observe the coincidence of the symptoms in question with the diminution in size of the lesions radiated. This is particularly the case in the various neoplasms, such as lymphadenomas, enlarged leukemic spleens, or uterine fibroids.

The hypothesis seems supported by the relation that exists between the duration of the period of incubation that precedes the trouble, and the degree of rapidity with which the radiated tumor begins to

regress. Two cases that I have observed will help to make this point clear.

The first case was that of a little girl, seven years old, with Hodgkin's disease. The entire course of her disease from its beginning to the fatal termination was twenty-three months. It was only in the eleventh month that she was first treated by roentgenotherapy, at which time the lymph-nodes of the neck, axillæ, groins and mediastinum were considerably enlarged, and there was also an enlarged spleen. She was a remarkably bright child, with a mind well in advance of her age. She never made the least complaint or said that she felt in any way uncomfortable during the treatments, which took place as a rule in the early afternoon. Yet several hours later in the evening she would be attacked almost invariably by nausea and vomiting, which was often repeated the following morning when she woke up.

One point to notice was that the vomiting took place several times when only the cervical lymph-nodes had been exposed. This is in contradiction to the opinion of Doctors Jones and Roth, who observed that in radiated patients, especially in cases of Hodgkin's disease, nausea and vomiting took place only after abdominal exposures, and were not seen after exposures of other regions of the body.

Another important fact was the rapidity with which the exposed nodes diminished in size, under the influence of the treatment. With the glands of the neck, this diminution was noticeable on the second day after the very first treatment.

The second patient was a woman of fifty years of age. I treated her for a fibroid of the uterus with metrorrhagia, according to my usual method, which consists of exposures at seven-day intervals for about twelve to fourteen consecutive weeks. During the first few weeks of her treatment, the exposures did not produce any reaction. Later, however, every course of treatment was followed regularly by a constant chain of symptoms. The treatments were given on Friday afternoon. During the exposure nothing was felt, and the next day the patient also felt well. Forty-eight hours later, on Sunday, she would begin to feel a general malaise, lose her appetite, and complain of headache and nausea. These symptoms would gradually increase in intensity, reaching their height on Monday, three days after the treatment. They would then disappear on Tuesday. To describe her illness, the patient was fond of using the following phrase: "A sea-sickness which did not come to a head."

It is well to recall here that under the influence of roentgenotherapy a fibroid of the uterus does not diminish in size as rapidly as do the enlarged lymph-nodes in Hodgkin's disease. When the fibromatous uterus can be palpated through the abdominal wall, and the distance of its upper pole from the symphysis can be measured, it is found in the favorable cases that this level is lowered at the rate of about one centimeter each week.

The two cases quoted above bring out the relation between the degree of rapidity of regression of the neoplastic tissues and the length of duration of the incubation period preceding the nauseous state. This connection is especially apparent when the doses used are not very large. I believe that the reason I have had an opportunity of observing this relation is because I hardly ever employ the so-called "intensive" roentgenotherapy. It is clear that with an increased dosage, and a consequently more extensive and more rapid destruction of the cellular elements of the neoplasm, the period of incubation would tend to shorten and finally disappear. At the same time the symptoms would become more severe.

This is what we are observing as the result of the improvement in our apparatus —especially since the introduction of the Coolidge tubes, which permit us to use much more penetrating rays, in greater amounts, and with thicker metallic filters, so that the deep organs can receive a much

greater amount of radiation without injury to the skin.

At the same time we must remember that in the uterine walls, and in the lymph nodes, it is not merely the diseased cellular elements which are exposed to the destructive action of the *x*-rays. The latter affect also certain of the normal cellular elements, especially the lymphocytes of the blood and the lymphoid tissues. It has been known for a long time that these are especially vulnerable to the rays, and very rapidly destroyed.

From the study of the clinical data, therefore, it would appear that the chief cause of the disturbances which may follow deep radiations is the passage into the blood stream of certain soluble substances, more or less toxic, resulting from the disintegration of normal and pathological cellular elements. To this must be added, in a small proportion of the cases, the direct effects of the penetrating rays upon the ganglionic nervous system of the viscera.

Experimental Data.—The careful observation of sick people treated by roentgenotherapy constitutes in itself a true experimentation, and probably the most instructive sort. It is a fact that up to now animal experimentation has offered very little towards the solution of our problem, but this may perhaps be because it is too much to expect a guinea-pig in healthy condition to solve the secrets of human pathology. It would be preferable to pick as subjects for experimentation animals who are diseased, and are affected with conditions justifying roentgenotherapy. Leukemia, cancer, sarcoma, and many other diseases are common among various animal species, as well as human beings. It might be advantageous for example to experiment on dogs with malignant tumors.

Still, experiments on healthy animals, such as those performed by Dr. Pfahler, have their value when repeated on a large number of subjects. I might mention one that it would be very useful to try. From the heart there go out certain centripetal nerves, the depressor nerves of Ludwig and Cyon. These are blended with the vagus in the dog, but are separate in the rabbit, the cat, the horse and the tortoise. The excitation of the central end of these nerves causes a fall in arterial pressure, and a slowing of the heart-beat. It would be interesting to attempt to expose these nerves to the action of *x*-rays. With this type of research we might be able to solve the problem of whether the ganglionic nervous system is affected directly by the rays during exposure. There would also be an advantage in studying, on animals heavier and more resistant than mice or guinea-pigs, the effects of leucocytic destruction by deep radiations.

Conclusions.—The "penetrating-irradiations-sickness," produced by either the *x*-rays or the gamma rays of radium, is caused chiefly by the adulteration of the blood with toxic substances, resulting from the disintegration of the pathological or normal cellular elements destroyed by these radiations.

The inhalation of a vitiated atmosphere and bad odors play only a secondary rôle in the production of the symptoms, but still at times may be important. From a practical point of view, precautions for assuring the purity of the air in the treatment room may be desirable, but they will not prevent the disturbances.

In spite of all precautions, it can be predicted that with the widespread use of Coolidge tubes, we shall see the number and intensity of these accidents increase.

The intenser radiation and greater penetration of these admirable tubes, together with much thicker metallic filters, allow us to deliver much stronger doses in the depths of the tissues, and produce a much more rapid and more massive cellular destruction.

Since, at present, by means of the Coolidge tubes we can obtain roentgen rays which are at least as penetrating as the lesser penetrating gamma rays of radium, there is no reason, theoretically, why the power of their penetration cannot

be very considerably increased as time goes on.

Intensive roentgenotherapy, the technique of which is far from perfection at present, is certainly destined to produce a therapeutic revolution. It will not only enable us to reach more rapidly the results to which we have been accustomed, but also to obtain results that we have up to now never hoped for.

However, it is important to consider whether one ought to employ intensive roentgenotherapy in all cases without exception.

It appears to me that the best method of avoiding the "penetrating-irradiations-sickness" (or, at least of restricting its effects) would be to limit the use of intensive roentgenotherapy to those cases where the nature and the course of the disease treated were such as to demand the most rapid type of treatment. In most of the other cases a milder and less rapid treatment would be preferable.

An analogy may perhaps make my point clearer. In the course of syphilitic disease, if cerebral complications should menace the life of the patient, or if ocular disturbance should menace his sight, it is necessary to use as intensive a treatment as possible. If the treatment is to be mercurial, the fear of a stomatitis should not halt the physician. On the other hand, if the lesions are milder, such as those of merely the skin or mucous membranes, then the treatment should be modified so as to avoid this disagreeable complication.

THE NEW BASIS FOR RADIOTHERAPY

WEIL states that our knowledge of the roentgen rays and how to manage them has been much increased lately, broadening their sphere of therapeutic action while augmenting their efficacy and their harmlessness. Benoist, for instance, has established that the specific opacity of simple bodies is a determined function and generally increases with their atomic weight. Certain substances, the radiochroic substances, sift out the rays, and the rays with short waves are the ones for therapeutic use, as they have the elective biochemical action.

Another law he cites is that the therapeutic action on the living cell is due chiefly to the secondary rays which the roentgen rays generate in the tissues; it is not due to the dose absorbed. The susceptibility to the roentgen rays is greatest in tissues whose reproductive power is greatest, whose karyokinetic future is longest, the reproductive power greatest, whose morphology and functions are the least definitely established. Weil concludes his review with the remark that many persons judge radiotherapy by the results they obtained with it during the early years of the use of the roentgen rays. They forget that the radiotherapy of today differs from that of yesterday as fundamentally as the surgery of the day differs from that of the era before Pasteur. (*Paris méd.*, Jan. 12, 1918, VIII, No. 2, p. 33.)

OSTEOMALACIA

ITS ROENTGENOGRAPHIC APPEARANCE AND CLASSIFICATION

BY GEORGE W. HOLMES, M.D.

Instructor in Roentgenology, Harvard Medical School; Roentgenologist, Massachusetts General Hospital.

OSTEOMALACIA is a comparatively rare disease. There are only four cases in the records of the Massachusetts General Hospital; and only a comparatively small number have been reported in the literature. The disease is particularly rare in this country, but more common in the Rhine Valley and in Northern Italy.

I should not feel justified in taking your valuable time to present this subject to you if it were not for the fact that osteomalacia is occasionally confused with primary malignant tumors of the bone and that the differential diagnosis is a matter of considerable difficulty.

In the past two years I have seen two cases in adults and on both occasions failed to make a correct diagnosis. The diagnosis may depend largely upon the roentgenographic interpretation and if based on an incorrect one, the treatment may be radical. The importance of keeping this disease in mind has been impressed upon me, through my failures; and it is with these cases in mind that I bring the subject to your attention.

FIG. 1. THE HYPOPLASTIC TYPE OF OSTEOMALACIA —IN CHILDHOOD DIAGNOSED AS OSTEOGENESIS IMPERFECTA.

There is a fracture of the femur, also one of the fibula.

A review of the literature gives one very little help regarding the *x*-ray findings. The only article I was able to find (which contained illustrations) was one by Osgood, Painter and Goldthwaite. Nearly all writers fail to mention the *x*-ray findings or describe them incompletely; and the subject is confused, in roentgenographic and in clinical literature, with osteogenesis imperfecta, achrondroplasia, fragilitus ossium, rickets and Paget's disease.

The pathological literature, however, is very complete. Von Recklinghausen, in his excellent work on the subject, has given us a classification based upon the pathological appearance of the disease in which he includes under the heading "osteomalacia," Paget's disease and rickets, as well as osteogenesis imperfecta and its allied conditions.

By the use of the prefixes hypo-, hyper-, myelo-, et cetera, he is able to describe the various types of malacia. This seems to me to be a very satisfactory way of avoiding confusion. The term osteomalacia, as generally applied, means a disease of the bones characterized by softening of the long bone, with loss of the earthy constituents, occurring in adults. This, in fact, is Gould's definition. It is, however, often applied to a similar process in the bones of children, in which there is hyperplasia and deformity as well as softening and loss of lime salts.

McCollum in his book on "Pathology" describes osteomalacia as being a disease in adults which resembles very closely that of rickets in childhood. From the point of view of the roentgenologist there are two distinct types of this disease, both of which occur in childhood as well as in adult life, and hyper- and hypoplastic malacia.

In adults, the hypoplastic form is seen more often in the female and is likely to occur during, or shortly after, pregnancy. The complaint which brings the patient to the roentgenologist is usually that of fracture. There is an absence of sufficient trauma. The bone presents an indistinct, hazy appearance, with lack of contrast between it and the soft tissues. The medullary cavity is increased and the cortex thinned. Often there will be present periosteal changes or callous formation which gives the appearance of the proliferation seen in periosteal sarcoma.

The bone most commonly involved is the femur. In fact, some authors state that the process is always below the belt line.

FIG. 2. THE HYPOPLASTIC TYPE OF OSTEOMALACIA IN ADULTS.

Fracture has occurred and there is considerable callous formation present. The diagnosis in this case was based on the pathological report.

The lesion may be single but is usually multiple. It affects the shaft of the long bones, the bones of the pelvis and spine, but does not involve the joints. The general appearance in the cases which I have had an opportunity to observe has been that of osteomyelitis. In fact, that is the interpretation usually given.

FIG. 3. LATERAL VIEW OF FIG 2.

The clinician will then inform you that the patient has no temperature or white count, and one is then apt to fall back on a diagnosis of syphilis, only to be told that there is no syphilitic history and that the Wassermann is negative.

At this time he should think of osteomalacia and should examine the other bones of the pelvis and lower extremities however much he is inclined to believe that he is dealing with a medullary sarcoma through which there has been a fracture.

The differential diagnosis from a single plate after fracture has occurred is extremely difficult; but the finding of similar changes in other bones would help. The great extent of the lesion in a single bone, without thickening or localized destruction

of the cortex, is also evidence against malignancy.

The following is a report of one case which I had the opportunity to observe and which was carefully studied at the Massachusetts General Hospital:

Patient.—American (female), age 39 years; white, single; born in Massachusetts. Referred to the hospital for fracture of the femur.

Family and Previous History.—Family history negative. Typhoid, "jaundice and pneumonia" when patient was between twelve and sixteen.

Present Illness.—Eight days before admission to the hospital, while walking across the room, the patient felt sudden pain in the left thigh. Her leg gave way and she fell to the floor. She was removed to a nearby hospital where she was kept on light extension until today, when she was brought into this hospital. Previous to the injury she had complained of neuritis in the left thigh.

Physical Examination.—Patient was rather stout with normal skin and mucous membranes. The pupils reacted normally to light. Chest and abdomen were negative. The reflexes were normal. The left leg showed deformity and tenderness in the upper thigh but no crepitus was made out.

FIG. 4. HYPERPLASTIC TYPE OF OSTEOMALACIA—IN CHILDHOOD SOMETIMES DIAGNOSED OSTEOGENESIS IMPERFECTA.

Note the coarse trabeculation in the shaft of the femur.

FIG. 5. PLATE TAKEN OF THE FEMUR AFTER AMPUTATION.

It shows the structure of the bone in more detail.

The patient was examined by the *x*-ray on April 14th, and a report of a definite pathological process with fracture involving the middle third of the femur (probably periosteal sarcoma) was made. A re-examination on April 17th confirmed the previous findings. The note stated that in the absence of previous injuries this was probably periosteal sarcoma.

A Wassermann which was negative was reported on April 18th. On the 20th, an *x*-ray examination of the lungs for a question of metastasis was negative.

The patient was seen in consultation by

three different surgeons and one syphilographer. All three surgeons advised amputation based on a probable diagnosis of malignancy.

The expert in syphilis stated that he saw no evidence of this disease in the patient. Her temperature before operation was slightly irregular, varying from normal to 101°. The pulse also varied from 80° to 100°. The urine was of rather high specific gravity and alkaline. The white count was 34,000.

On April 27th, the patient was operated upon and the leg amputated at the hip. She made an uneventful recovery from the operation and a note made one year later stated that she was feeling fine, had secured an artificial limb and that the stump was completely healed.

The following is a copy of the pathological report based on the surgical specimen:

"The leg was amputated in the upper part of the femur. At the middle there is a comminuted fracture, the ends of the bone roughened and irregular; the tissue about infiltrated with blood and fibrous bands of tissue between the bundles of muscular fiber. Periosteum is thickened and can be stripped off from the bone, leaving a granular surface. The medullary cavity was filled with rather dark marrow. Walls of the bone not materially thinned except at the point of fracture.

"Microscopical examination of muscle showed round cell infiltration with formation of fibrous tissue and atrophy of the muscular fibers. In one of the large vessels was a soft white thrombus adherent to the wall on microscopical examination, showing it to be composed of blood and fibrin. Section of the bone at the site of fracture showed the trebeculæ rather thin and medullary spaces filled with rather a fibrous tissue in places with considerable round cell infiltration. In one area there were numerous large multinucleated bodies suggesting osteoclasts. From the study of the preparations up to the present time, differential diagnosis seems to be between an inflammatory process and one of the trophic disturbances. There is no indication of a new growth. 16,4-139."

I saw the other case only in consultation and I shall not report it in detail, as the findings were not complete.

After a review of the literature and study of all the plates I was able to obtain on cases of osteogenesis imperfecta, fragilitus ossium, osteomalacia and Paget's disease, I feel that there are two distinct types of the disease—a hyperplastic and a hypoplastic with various gradations between—and that it may occur either in adults or in children.

FIG. 6. CASE DIAGNOSED CLINICALLY AS OSTEOMALACIA. Its appearance is atypical. There is proliferation as well as destruction of bone taking place. The destructive process apparently predominates.

It seems to me that these cases could be grouped together roentgenographically

even more easily than pathologically, classing them all osteomalacia as von Recklinghausen has done.

In the hypoplastic group in children are the cases generally classed as osteogenesis imperfecta or fragilitus ossium. In these cases there is loss of lime salts and thinning of the cortex which produces a diminution in density. The trabeculæ remain normal. Change in the size or shape of the bones does not occur unless fractures are present. A large number of these cases do show multiple fractures with deformity and more or less callous formation.

In the hyperplastic group are the cases occurring in infants and early childhood sometimes diagnosed as osteogenesis imperfecta and sometimes as osteomalacia. These cases show both destruction and proliferation of the bone and the trabeculæ are irregular. There is a diminution of lime salts and an increase in the fibrous tissue.

The long bones are widened, particularly at the diaphysis, and there is extreme bowing and deformity. The pelvis and spine are also deformed. The picture resembles rickets but does not show the characteristic changes along the epiphyseal line. Fractures are less common in this type.

FIG 7. CASE DIAGNOSED CLINICALLY AS OSTEOMALACIA.

The radiographic appearance suggests the condition usually diagnosed as osteogenesis imperfecta. It can be classed as hypoplastic malacia.

FIG. 8. PAGET'S DISEASE. THE HYPERPLASTIC TYPE OF OSTEOMALACIA IN ADULTS.

The hypoplastic type in adults (commonly called osteomalacia) may be localized or general. There is thinning of the cortex and absorption of lime salts without proliferative changes or deformity.

In the hyperplastic type in adults multiple fractures are not common. We have proliferation and lying-down of the new bone along with the destructive process.

The trabeculæ are coarse and irregular. The bones are large, bowed and deformed —the picture seen in typical cases of Paget's disease.

Of course, there are cases which fall between these groups; but usually one or the other forms will predominate and the class can be readily grouped. At any rate, it would avoid the use of definite names for diseases which overlap and run into one another and it gives the roentgenologist a definite pathological basis upon which to base his interpretations. The differential diagnosis in children is from rickets and achondroplasia, both of which conditions show their greatest activity along the epiphyseal line and in the epiphysis, whereas osteomalacia is a disease of the shaft as well.

In adults, the differentiation is from primary and metastatic malignant diseases, syphilis and osteomyelitis. The wide extent of the local lesion or the presence of multiple lesions will usually differentiate it from primary malignancy. Differentiation from metastatic malignancy (carcinomatosis) is more difficult.

The local lesion is apt to be more extensive and the bones of the upper extremities and skull are less often involved.

Syphilis, when general in the bones, is usually periosteal in type, whereas osteomalacia is a disease of the cortex and medullary portion of the bone.

In differentiating Paget's disease from syphilis, I have found the absence of involvement of the epiphysis in syphilis and early involvement in Paget's disease of definite help.

Osteomyelitis, while usually a localized process, may involve several bones. Periosteal changes are the rule, while they are generally absent in osteomalacia.

Clinically, cases of adult osteomalacia may have a rise in temperature and an increased white count; but they do not present these findings to any such degree as osteomyelitis. In the hypoplastic type the amount of lime salts in the urine is increased.

The prognosis as far as cure is concerned is bad. Some cases of the adult hypoplastic type have been benefited by castration. Roentgen therapy directed to the ovaries should be considered.

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ECHINOCOCCUS DISEASE OF THE LUNGS

BY LLOYD B. CROW, M.D.

Captain, Medical Corps, U. S. A.; Roentgenologist, Post Hospital, Fort Worden, Washington;
Formerly Director of the Laboratoire Hospital, Broussais, Paris

ECHINOCOCCUS disease of the lungs is sporadic throughout the world, but it is not commonly encountered outside of Iceland, where it seems to be quite prevalent, and in certain parts of Austria, Australia, Italy, Germany and the Argentina. It is interesting to note that the echinococcus may attack any organ of the body, but appears to have a special predilection for the liver, occurring in that organ in about forty to seventy per cent of cases.[1] The echinococcus does not show the same partiality for the lungs; compiled reports showing them to be the seat of the disease in only about twelve per cent of the authentic cases known at the present writing. Somewhere near two per cent occur in the kidneys, and the rest of the organs of the body are indifferently attacked by the parasite.

An echinococcus cyst of the lung shows in the radiograms as a distended bladder, casting a fairly dense shadow and occupying a central position in the lung tissue, ranging in size from five to twelve centimeters in diameter. Ordinarily only one cyst is seen in the lung field, though there may be a juxtaposition of several on both sides of the chest.

The work of Paul Krause admirably shows the difference in degree of absorption of the *x*-rays by cystic fluid and ordinary pus. It would appear from his deductions that the fluid of a hydatid cyst does not possess any great power of absorbing *x*-rays. After the cyst has become infected, and pus has formed within the cavity, gas generates and is seen in the fluoroscopic screen, or in the radiogram, as a dark ring. The conclusions of Krause were obtained by taking several cysts and filling them respectively with cystic fluid and pus. These were placed in artificially distended lungs and their relative powers of absorption obtained.

In the dark ages of medicine and even of later years, the diagnosis of echinococcus cyst of the lung was made by watching the patient until a vomica would burst into a bronchus, and the resulting expectoration of the daughter cyst had clearly defined the nature of the malady. We were rather surprised to read in a number of the "Bulletins et mémoires de la société médicale des hôpitaux de Paris" of a case reported by Ramond which was allowed to go two years before the characteristic expectoration occurred with its diagnostic detritus. Radioscopy unfortunately was only utilized after the cyst had ruptured. Today the diagnosis of echinococcus cyst has fortunately been placed on a more scientific basis and, we believe, a more gratifying one to the patient. There are three chief factors on which the diagnosis may be based: first, the *x*-ray examination; second, the eosinophilia; third, the Bordet-Gengou fixation of the complement, or what is otherwise known as the Weinberg Parvu test for determining the presence of an echinococcus infection. The second and third are of no great value as they are not constant.

We were quite astonished, in reviewing the literature of echinococcus disease of the lungs, to note how well the early roentgenologists were orientated on this subject and we deem the following incident worthy of insertion in our publication. In 1900 P. Helpeln reported a case of aortic aneurysm to the medical society of Riga. Now it appears that a roentgenologist named Sengbuch, just one year prior to this, had seen the case and proclaimed it an echinococcus cyst of the lungs from the roentgen findings although he was positive that he could

[1] Charles Bles, (Amsterdam), Fortschr. a. d. Geb. d. Röntgenstrahlen, Hamb.

feel a thrill over the chest. In 1912 P. Helpeln reports the same case in the *Berliner klinische Wochenschrift* as an echinococcus cyst of the lung.

The history of our case is quite interesting as will be seen in the following brief anamnesis. A young man, thirty years of age, a native of Spain and by occupation a farmer, came to us in the early part of November 1917. He stated that his present trouble began five years ago by sharp intermittent pains striking him in the upper part of the back about the shoulder blades. At first these pains were of no consequence but after a few months they materially hindered him in his work. Some six months later he began to complain of gastric distress and the usual signs of indigestion. It appears that a few minutes after eating the patient experienced a sensation of fullness in the epigastrium associated with eructations of gas. After a time these distressing symptoms disappeared and left him with a sensation of nausea. A very interesting factor in the history at this period of his illness, was that walking or standing relieved this temporary indisposition on the part of the digestive apparatus. In the latter part of his illness the patient began to experience pains in the back during the late sleeping hours of the night and suffered from insomnia. Eating did not relieve the stomach distress nor did the pains appear at any special time after eating.

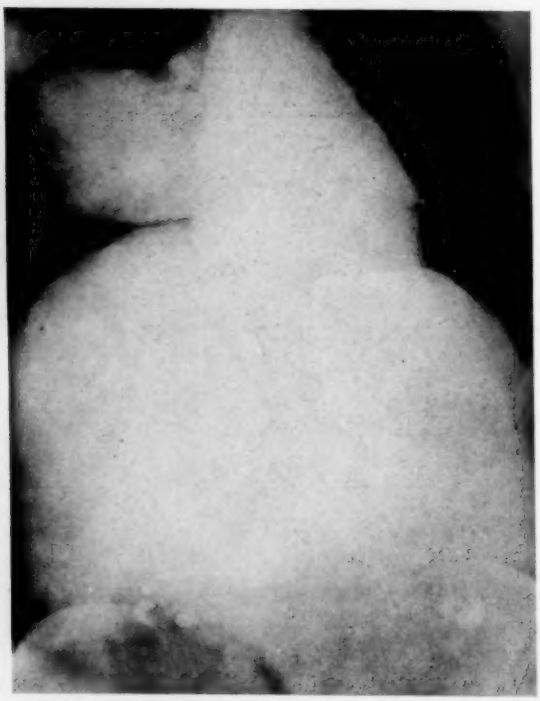

FIG. 1. ROENTGENOGRAM TAKEN IN THE ANTEROPOSTERIOR POSITION.

Past History.—Patient had typhoid at age of 14; malaria ten years ago; and has had many subsequent attacks since.

Family History.—Negative.

Habits.—Does not use alcohol. Is very fond of dogs.

Physical Examination.—Physical examination was negative and the patient was referred to the *x*-ray laboratory for a gastro-intestinal examination.

Roentgenological Examination.—Viewed in the anteroposterior position the cyst was visualized quite plainly in the fluoroscopic screen occupying a position in the inferior portion of the chest cavity some two centimeters above the diaphragm.

FIG. 2. ROENTGENOGRAM TAKEN IN THE POSTEROANTERIOR POSITION.

The lateral diameter of the cyst was computed to measure about twelve centimeters and the vertical about ten centimeters. Stereoscopic plates were taken and from these we advanced the opinion that the cyst was connected to the mediastinum. Suggestion was made that the cyst be punctured under guidance of the fluoroscopic screen, but we advised against this procedure as we were afraid of producing an anaphylactic shock and endangering the life of the patient. Miraillie collected forty-three cases in which simple puncture was performed with two cures, twenty-two deaths, and ten negative results. According to Dieulafoy there is only one procedure to follow in these cases and that is pneumotomy. A cure is obtained in about ninety per cent of operations.

Operation.—On November 19, 1917, the patient was given a nitrous oxide anes-

FIG. 3. ROENTGENOGRAM TAKEN IN THE LATERAL POSITION.

thetic and the operation performed as follows: a lateral skin incision was made along the right border of the sternum extending from the upper border of the third

FIG. 4. PHOTOGRAPH OF CYST AFTER REMOVAL.

rib to the lower border of the fifth rib. Very small incisions were made over the third, fourth and fifth ribs in the mammary line. The incision was carried along the upper border of the third rib to the parasternal line and likewise the incision was made from the mammary line along the fifth rib to the sternum. The ribs were next fractured in the mammary line and the cartilages cut along the border of the sternum. When the incision was complete, the square flap thus formed measured about twelve centimeters. The intervening soft parts were now cut and using the external border of the flap as a hinge, an attempt was made to lift it. In making this attempt the pleura was torn with the resulting collapse of the right lung. After the flap had been laid to one side a good exposure of the collapsed lung was obtained and imbedded in its tissue was seen the white glistening mother-of-pearl-like surface of the cyst. The cyst was attached to pericardium and the pleura.

The inner layer of the cyst was dissected away from the outer fibrous layer and when free, lifted through the opening where it unfortunately burst and allowed the contents to spill in the chest cavity. The cavity was well sponged, and after thorough cleaning, an attempt was made to remove some of the outer fibrous layer, but in this we were compelled to desist as the slightest traction on the lung caused immediate cessation of respiration. The cavity was packed with gauze dipped in a ten per cent formol glycerine solution, enough of the gauze being left to give adequate drainage. The flap was stitched in place with silkworm gut and the incision closed. The patient was transported to his bed in a very low condition. During the first forty-eight hours the patient remained in a state of shock bordering total collapse. On the 18th, three days after the operation, the temperature rose to 102, pulse 140, and respiration 46 to the minute. A profuse expectoration of brown mucopurulent pus, accompanied by severe attacks of coughing, occurred at this time.

On the 2nd day of November the condition of the patient was very bad. He was cyanosed and at the same time quite delirious. Another alarming condition which annoyed us greatly was the sucking in of material through the opening of the flap. This we combated by taking a large rubber dam such as dentists use and spreading it over the opening into the chest. The sides were held down by adhesive plaster and bandages. One side was allowed to remain open so as to allow air to escape during expiration. After a few days the lung began to expand and resume its normal function.

For two weeks the patient ran a septic temperature but gradually his condition improved to such an extent that he was able to sit up and take nourishment. On December the cough had subsided and he was practically without fever during the day having only a slight rise in the evening.

By the first of January his condition was very gratifying to us as he had gained 20 pounds and we contemplated allowing him to leave the hospital in a few days. Much to our chagrin, the patient was taken with a fit of coughing and expectorated a large quantity of muco-purulent material. There was a return of the fever with an occasional night sweat.

At the present time the patient has recovered and will soon leave the hospital as cured.

My acknowledgment to Doctor Mario Isnardi for the case referred and the clinical data furnished.

PRESIDENT'S ANNUAL ADDRESS*

BY WILLIS F. MANGES, M.D.

Lt.-Col., M. C., U. S. A., President.

GENTLEMEN OF THE AMERICAN ROENTGEN RAY SOCIETY, AND OUR GUESTS: We are here to open a new page in the history of our Society. We hope that it will be one worth writing and one worth remembering. I have the unusual honor to preside at a military medical training camp—the first time that any medical society (that is, outside of the military organization) has met on such ground. This has been made possible and desirable largely because of the farsightedness and broadmindedness of our Commandant. For it was he who, while still in the Surgeon General's Office, decided that the best place to teach roentgenology to military men was at a military training camp; that the preliminary training at least should be given under such conditions.

We are ready to present to you for inspection and consideration the efforts put forth by those who have been here to take charge of the teaching of roentgenology. The results you will see are not due to any personal ability in the way of organizing or administering, but rather to the coöperation of the Commandant and his entire staff on the one hand, and the hearty support of the Surgeon General, through the *X*-ray Division, on the other hand. Ample space and equipment have been obtained with the least possible delay. Every assistance has been given in the matter of selection of officers for the course of instruction, and we believe this has been better accomplished here than it could have been done elsewhere. There have been times when we could not obtain as many student officers as were desired in the school, but this was for the reason that officers were not available.

There are many reasons why this is an ideal place for such a school. In the first place, the military atmosphere, so to speak, keeps a man at his best physically and mentally, and also more in the spirit of the purpose for which he is training.

Here there are always men who are doing their utmost to advance and become leaders. It is this sort of example that makes every other man apply himself seriously.

This school organization is only a small part of the great training camp, but it is the more positively an organization since it is a working part of a perfectly organized plan, commanded by an officer of great ability and wide experience.

The end results of any organization are directly dependent upon the coöperation that exists within the personnel of the organization; in this case among the instructors and assistant instructors as well as the students. We can assure you that in the Camp Greenleaf School of Roentgenology this spirit of coöperation is of the highest type.

The instructors have been selected because of their special fitness in the various subjects of the course, and they, in turn, have selected their assistants on the same basis. Each department has its own duties and responsibilities, and the instructor at the head sees to it that the work of his department is well done. The work of all is so correlated as to give the student officers the best foundation and preparation for the work they are called upon to do in the service. Little attention is paid to subjects that have no special bearing on the needs of the occasion.

The student officers on their part have always manifested a marked enthusiasm in their efforts to learn what is required of them, and we have been more than pleased with the results as shown by practical demonstration as well as by means of examinations held each week.

*Nineteenth Annual Meeting, American Roentgen Ray Society, September, 1918.

We would like to tell you more about the various phases of development of the school, but time will not permit. Then, too, it is more fitting that the history of this development should be recorded at a later time, for the process of development has not ceased. Even now we are contemplating extensive additions in order that the school may have a much greater capacity.

We believe that this school will have a far reaching and important influence in the future. For not only have we made roentgenologists, but we have been called upon also to instruct the medical officers of the various other specialties as to the manner in which they can make the best use of the roentgenologist.

Always we have made the plea for cooperation, and have done everything possible to maintain high ideals. In short, we are here among a large number of special schools all working for the same purpose—to make our medical officers more competent to care for those wounded in battle. There could be no more fitting place for such work than in this large camp, where order, discipline, enthusiasm and a great spirit of loyalty exist.

This meeting will add materially to our efforts here, and we are certain that you will all be glad to have come and to have given this help. We owe this privilege to the Commandant of this great camp, Colonel* Munson, whom I now have the honor to present to you.

ADDRESS OF WELCOME

BY BRIGADIER-GENERAL MUNSON

Commandant of Camp Greenleaf

CHICKAMAUGA PARK, GA.

GENTLEMEN OF THE AMERICAN ROENTGEN RAY SOCIETY: Camp Greenleaf extends to you its most cordial welcome and hopes that your exercises here will be of the greatest profit. You are present on historic ground—historic ground for the achievements of the past, and future historic ground for present achievements—for we are making history here and not the least of the factors is the history in *x*-ray work which your Society is creating. Camp Greenleaf is the proper place for your meeting; for Camp Greenleaf is now the great medical center of America. It is at the present time the medical university of the profession of this country. There are here at the present time some 2700 officers of the Medical Department. That number is constantly increasing. A few days ago two hundred came in in a single day. There have matriculated at this University up to the present time, nearly 9000 officers, and as time goes on we hope and believe that the profession of America which passes into military service will largely, if not wholly, pass through this place.

You have here more than a selected personnel available for your further selection—you have here the facilities and the esprit which go with a great institution of this sort. How great an institution it is I may intimate by saying that we have at the present time fourteen different professional schools, which have approximately 500 student officers, about 150 of whom are matriculants who have not yet passed in the professional courses because they are taking the military course as a preliminary step.

The military work which precedes your *x*-ray course is the fundamental thing of the whole scheme. You are being transformed from civilian doctors, experts in

* Promoted to Brigadier-General after this address was delivered.

your line, into medical officers, experts in still broader lines, and made conversant with the difficulties of medical practice under the requirements of military service which must modify all your ideas, all your opportunities—perhaps even all your facilities. You must do things not the way, perhaps, that you would wish, but the way the military situation demands, for the military situation is paramount.

The number of medical officers who will come here in the future for training will, as I say, steadily increase. You have at the present time one of the most flourishing schools. In round numbers there are 58 officers matriculated and half a dozen or more taking the basic course, awaiting their opportunity. With these officers are being trained approximately two enlisted men to each officer with the view of assisting the officer, and taking much of the routine mechanics of your specialty off the hands of the medical officer to relieve him for other and higher duty. I believe this training of enlisted men, this training of assistants to the roentgen-ray officers, is by no means a small thing, even though a smaller part of your function.

In this work, at this medical university at Camp Greenleaf, the greatest medical university in America, gentlemen, the roentgen-ray school is serving all departments. Not only every branch of the division of surgery and the division of medicine, but even the dental division, comes under your purview and asks for your assistance. That assistance has been given most freely and most efficiently. The work here is one of team-work. No place like this is a one man's job. It represents efficiency, and that efficiency depends upon coördination; coordination depends upon willingness, zeal, endeavor, and ability; and these, gentlemen, we are cultivating in everybody here, in all the branches of the camp.

Now with regard to your own roentgen-ray school. We conceive here that we have, perhaps, the best roentgen-ray school in America, if not in the world. We conceive that we have here the best that the Roentgen Ray Society of America offers in the way of instructors; that it stands back of the school and that it guarantees its products; and we conceive that the certificate of graduation of this school at Camp Greenleaf is the highest evidence of professional efficiency in roentgen-ray work that can be given in the United States.

Now, gentlemen, this roentgen-ray work, this roentgen-ray school, is largely in the care of one man, and that man is the President of your Society. You claim him as a scientist. We perhaps know him not only as a scientist, but better as a soldier: for he has well demonstrated these qualities—the dual qualities of the soldier and scientist—in a most eminent degree.

Now, gentlemen, we extend to you, with the greatest of pleasure, all the facilities of Camp Greenleaf. This, we understand, is a business meeting, and not a meeting for entertainment. We have opportunities here not only for work and development in roentgen-ray work, but in food for thought and reflection in very many phases of the medical military work. You could with profit put in a week and not see it all. I have not seen it in all its full details yet. There are various training branches of greatest importance, and the magnitude of it all will be understood when I say that by the end of the week this camp will have approximated a strength of probably over 30,000 officers and men. Each part of the camp has its own particular purpose: for we are covering here every one of the organizations that the Medical Department has; and it probably has more organized formations than any other branch of the military service. Here we are trying to produce them all: and because of the efficiency of Major* Manges and the other chiefs, we think we are producing them creditably. So Camp Greenleaf welcomes you, and places at your disposal everything that it has.

*Promoted to Lieutenant-Colonel since this meeting was held.

ANNUAL REPORT OF ROENTGEN RAY DEPARTMENT ARMY MEDICAL SCHOOL, WASHINGTON, D. C., 1917-1918*

HOWARD E. ASHBURY, M.D.

Major, M. C., U. S. Army

THE Army Medical School is in close affiliation with the Surgeon General's Office and it is here that medical officers are trained for the Regular Army. In the Physical Examination Department, thousands of applicants for commissions in the Army are examined monthly.

The Commandant, Brigadier-General William H. Arthur, is Professor of Military Surgery, and President of the Faculty and the Medical Board of the School.

In addition to exercising its own peculiar function as a training school for officers the School laboratories are called upon by the Surgeon General's Office to carry out special investigations and report upon new methods for adoption by the Army.

The bacteriological, vaccine, chemical, and *x*-ray laboratories play important parts in this work. This is especially true of the Vaccine Laboratory, where the entire supply of typhoid vaccine is prepared for the troops. Col. Whitmore, who is in charge of the laboratories, has trained a large number of enlisted men as laboratory assistants in bacteriology and chemistry.

The officer in charge of the *X*-ray Department is the Professor of Roentgenology and a member of the faculty. The *x*-ray laboratory occupies a part of the first floor, rear, of the building, and a part of the sixth floor, and is divided into: (1) Laboratory for patients where cases are examined which are referred from the Army Medical School physical examination room, the Surgeon General's Office, the Attending Surgeon's office, and from among the officers and enlisted men and their families in and about Washington. (2) Laboratory for instruction, which adjoins the patients' laboratory. (3) Photographic laboratory.

At the outbreak of the war these three laboratories were together and the student officers received their practical instruction in the patients' laboratory one afternoon a week. But when the course of instruction was changed from one to three terms per annual session of about fourteen weeks each, and a class for enlisted men as manipulators started, it became necessary to rearrange the quarters so that daily classes could be held without interfering with the routine work of the department. This was accomplished by moving the photographic laboratory to the sixth floor, where three well lighted rooms were available. This additional space was fitted up with a Waite and Bartlett transformer and other apparatus that we had on hand, and a dark room and labyrinth installed—the work being done by the officers and enlisted men of the school and regarded as elementary instruction. We endeavored to follow the plans for base hospital operating and dark rooms as closely as possible.

The clinical *x*-ray laboratory was partitioned so that we were able to secure an office, an additional room for dental examination, and a control space for the large operating *x*-ray and fluoroscopic room. By removing a large labyrinth into the dark room, a plate loading space was secured which could supply the operators and feed exposed plates into the dark room. A smaller and less elaborate labyrinth was built to connect these rooms. The plate-examining room, which was quite large, was divided so that a waiting room was secured. This gave more privacy for plate study, which is really the most important part of any laboratory. Special view boxes with indirect lighting, and shelving above and below, were designed and built around the room and were found so satisfactory that

* Read before the nineteenth annual meeting of the American Roentgen Ray Society, Chattanooga, Tenn., September, 1918.

the plans were adopted by the Surgeon General's office for use in army laboratories. Plans for these boxes were drawn at the school and are on exhibition here. Plates are indexed and filed for easy reference and specially arranged for purposes of instruction.

Personnel.—Since the chief function of the Army Medical School is to train men for the army, our personnel has not been permanent, for as fast as an officer or man develops, he is sent out to engage in work in broader fields and others take his place. Of the men originally at the school in August, 1917, only two remain.

The personnel of commissioned men is as follows:

1 Major, M. C., Officer in Charge—Professor of Roentgenology.
1 Captain, M. C., Instructor in the Laboratory for Instruction.
1 Captain, M. C., Instructor in the Laboratory for Patients.
1 Captain, S. C., In charge of installations and repairs.

While the non-commissioned officers are:

1 Hospital Sergeant—in general charge.
1 Sergeant, 1st Cl.—Property.
1 Sergeant, Assistant Instructor.
1 Sergeant, Delco Engine Expert.
1 Sergeant, Photographic Laboratory.
12 Pvts. 1st Cl. — manipulators, electricians, draftsmen, photographers, dark room men, chauffeurs, etc.

Instruction.—The student candidates are selected from the applicants for the regular army who have successfully passed the entrance examinations.

The curriculum of the school consists of: Bacteriology, Medical Department Administration, Chemistry, Military Hygiene, Military Surgery, Military Medicine and Tropical Medicine, Sanitary Tactics, Ophthalmology, Operative Surgery on the Cadaver, Lectures by Special Professors and Roentgenology.

Successful candidates who secure a general average of 80% and + points are commissioned in the Regular Medical Corps.

It can readily be seen that our purpose cannot be to make these officers roentgenologists, so we aim to give them a healthy respect for this specialty, to help them to avoid the usual mistakes of the average surgeon and to enable them to intelligently pass on requisitions, etc., going through their hands to the Surgeon General's Office.

They have been given one hour a week lectures and one hour a week in practical laboratory instruction, demonstrating apparatus, the operation of machines, the localization of foreign bodies by the methods adopted by the Army, and the practical interpretation of roentgenograms, with particular reference to the diagnostic points in the pathology of the parts concerned. Special stress has been laid on the use of the newer types of apparatus adopted recently for use in the present war.

Three classes of student candidates and three sections of the Orthopedic Class have passed through the school:

Sections of Student-Candidates

3rd Class, 21st	Session—	75 men
1st Class, 22nd	" —87	"
2nd Class, 22nd	" —85	"
3rd Class, 22nd	" —57	"
		304

Orthopedic Sections

1st Class—25	1 Naval	
	6 Relieved	
	1 Discharged (Phys.)	
2nd Class—26		
3rd Class—15		
	66	

By request of the Division of Orthopedic Surgery, of the Surgeon General's Office, the officers on duty in the Army Medical School, Orthopedic Section, are given the same general course as the student-candidates for the army and, in addition, special plate interpretation of bone pathology.

At the request of the Division of Internal Medicine of the Surgeon General's office, the officers who reported for duty on Tuberculosis Boards were given instruc-

tion in interpretation of roentgenograms of tuberculosis. This instruction covered two classes—two hours twice a week for a period of about three months, each officer averaging about eight hours' instruction. Eighty-eight officers secured this instruction. Patients referred for examination from the training camp at Fort Meyer and other camps near Washington were used for instruction and the clinical and *x*-ray evidence compared in the presence of the classes. An outline of the instruction follows:

Outline of Instruction for Student-Candidates

LECTURES

1. Electricity, Low and High Tension Current.
2. *X*-Ray Properties. *X*-Ray Tubes.
3. Apparatus for Use in
   - General Hospital
   - Base Hospital
   - Evacuation Hospital
   - Portable Outfits
4. Fluoroscopy Roentgenography.
5. Dangers and Precautions, Electric Shock.
6. Lantern Slide Demonstration of Positions and Technique.*
7. Bone Pathology.
8. Head and Teeth.
9. Urinary Tract.
10. Chest.
11. Gastro-Intestinal Tract.
12. Localization of Foreign Bodies.
13. Review.
14. Examination—Written.

LABORATORY

1. *X*-Ray Apparatus, Army Types.
2. Description and Operation of Gas Tubes.
3. Description and Operation of Coolidge Tubes.
4. Roentgenography; Making Roentgenograms.
5. Protection of Patient and Operator—Testing Protective Measures.
6. Interpretation of Normal Bone Plates.
7. Plate Interpretation: Bone Pathology.
8. Plate Interpretation: Head and Teeth.
9. Plate Interpretation: Urinary Tract.
10. Plate Interpretation: Chest.
11. Plate Interpretation: Gastro-Intestinal.
12. Localization of Foreign Bodies.
13. Review.
14. Examination—Practical.

*See Book of Prints and Positions, Normal Anatomy.

Outline of Instruction for Enlisted Men

The need for enlisted *x*-ray technicians and manipulators in the Medical Department necessitated the establishment of a school of instruction, which was put into operation August 16, 1917. These men were selected from recruits who had had previous electrical experience, or a knowledge of photography. But a large number had no previous experience in *x*-ray work.

The outline of instruction is as follows:

LECTURES

1. *X*-Ray in General.
   Excitation Tubes in General.
   Tubes: Hydrogen, Gas, Coolidge.
2. Plates, Envelopes, Films, Screens, Cassettes.
   Exposure Effects.
   Developer.
   Fixing.
   Plate-Holder.
   Marking Plates.
3. Electricity: terms and principles.
   Dynamos—Motors.
   Electricity—Magnetism.
   Ohm's Law.
   Lenz's Law.
4. Coils.
   Choke Coils.
   Transformers.
   Interrupters.
   Rheostats.
   Auto-Transformer Control.
5. Exposure Factors: K, Voltage, Amperage, Time, Distance, Saturation Curve, Critical Curve.
6. Relation of Shadow to Radiation Tube Shift. Shadow Traverse.
7. Standard Positions.
   Stereoscopy.

8. Fluoroscopy.
9. Use of Transformer Chart—Trouble and Trouble Hunting.
   Wiring. Machines.
10. Troubles and Difficulties. Plates: Developer. Over and under exposure.
11. Lecture on Osteology.

LABORATORY

1. *X*-Ray Machines, General.
   Wiring, trace wiring. Make diagram.
2. Coils and Interrupter.
   Saturation Curve.
3. Transformer Chart.
4. Views of Arm Model Ex. 6—Relation of Shadow and Direction of Radiation.
5. Relation of Time of Exposure to Target.
6. Current and Time Relation.
7. Voltage Law. Ex. 9.
8. Making Plates of Normal Parts.
9. Keeping records and clerical work, (see exhibit).
10. Weekly written tests are customary. A number of the examination papers are on exhibition.

This instruction averages two hours' daily didactic instruction, and two hours' practical laboratory work on machines and in the dark-room.

Upon completion of the course, enlisted men are afforded practical experience by work in the Army Medical School Laboratory for Patients, Soldiers' Home, Providence Hospital, George Washington University Hospital, Georgetown University Hospital, Children's Hospital, Episcopal Hospital, and the Walter Reed Hospital, Washington, D. C.

Lists of qualified technicians and manipulators are sent to the Surgeon General's Office, *X*-Ray Division, for assignment to duty elsewhere. One sergeant who completed the course here, while on duty at the Soldiers' Home installed and operated the electro-therapeutic department. This sergeant is thoroughly conversant with the installation and the practical application of modern therapeutic apparatus and is now on duty in France.

Those qualifying who show special adaptability are retained at the school as assistants. Several have received commissions in the Sanitary Corps. Upon receiving their commissions they are ordered away from the school. One assistant instructor is now on duty at Camp Greenleaf School of Military Roentgenology. Others have been ordered to France in various capacities.

Mention should be made here of the special aim in training technicians and manipulators. These men are supposed, primarily, to be able to care for the *x*-ray apparatus, to make minor repairs, and to keep the machines running satisfactorily. A number of them thoroughly understand the electrical construction and are able to do almost every kind of repair work. These men are usually given assignments where their knowledge will be most useful; they are called technicians. Secondly, the men are instructed in making exposures of patients, developing the plates, and in general dark-room work. They are given a little osteology to enable them to intelligently make plates of the parts of the body requested by the surgeon. They are called manipulators, and they work under the immediate direction of the roentgenologist. In no way is it to be understood that they are meant to interpret roentgenograms, to give opinions on plates they have taken, or to do fluoroscopy. It is not expected that they shall in any way usurp the duties of the roentgenologist.

Certificates of Proficiency are given to men who are found qualified, technically and morally, to perform these special duties. Enlisted men found to be disqualified, after a fair trial in the class room, are transferred to other duties. The number of men who have passed is 174; number not qualified, 8; number transferred to other duty, 13; number discharged, 2 (one to complete a dental course and one having been court martialed); making a total of 197.

These manipulators and technicians are on duty in most of the cantonments and

camps and the reports received have been, for the most part, favorable. A large number are now on duty in France. I feel sure they may be of the greatest assistance to the over-worked roentgenologist.

The question is asked, "What will become of the men after the war?" "Sufficient unto the day is the evil thereof." I am thoroughly convinced that the manipulator can produce satisfactory routine plates and that he can turn out a large quantity of work; also, that the roentgenologist who utilizes his services will be in a position to give more time to the medical side of his work, including fluoroscopy, therapy, and plate study. How often do we see the plates hurriedly gone over, because after spending the greater part of the day on purely mechanical things (which the manipulator can do) one has not the time to go into history, physical examinations, and careful plate study, all of which are so necessary to correct diagnoses. The roentgenologist has developed special skill in medical and surgical diagnosis, which, after all, is the consulting roentgenologist's proper sphere. This is proven by the almost universal demand for his opinion, not only in reference to diagnosis, but also to treatment. Does it not often fall to our lot to make the decision, pro or con, for an operation? Shall we accept this responsibility, or pass the buck and go on being technicians for the real doctors?

X-Ray Clinical Laboratory.—A medical officer roentgenologist is in attendance, seeing all patients and getting a short history directly bearing on the examination that is to be made. He personally makes all fluoroscopic examinations and notes in the history book the findings. He directs the manipulator in making plates in the positions necessary to show the pathology in question. Regulations controlling routine examinations with a standard table of positions and technique are adhered to.

Reports on examinations are made by the officer in charge and delivered by special messenger the day following the examination. Plates are filed numerically and those of special use for instruction are filed separately. Card indices of cases are filed alphabetically by pathological headings. An instruction index is used, which follows the classification adopted by the Conference for Standardization of Apparatus and Methods, held in New York in June, 1917.

A graphic chart is kept showing the rise and fall of the work done in the clinical laboratory. This chart shows at a glance the number of films and plates taken daily and monthly, and is of help in requisitioning supplies, particularly for the annual requisition, as it depicts the increase in the work during the year.

There were 2060 patients seen between September, 1917, and June 30, 1918. During the same period 3799 radiographs, and 5323 dental films were made.

Photographic Laboratory.—The photographic laboratory is in charge of a noncommissioned officer who had previously had experience in commercial photography. The work consists of taking photographs for the various departments of the school and things of interest to the medical department, of preparing lantern slides, and of making prints. Facilities are present for making enlargements and reductions and for copying drawings, tracings, and photographs for the preservation of records. There is, also, special apparatus for making microphotographs.

From September, 1917, to June 30, 1918, the following amount of work was done: 807 negatives, 2188 prints, and 1225 lantern slides made.

Special Activities.—It has been our endeavor to furnish special practical information concerning apparatus, material, and methods adopted for use in the army by the *X*-ray Division of the Surgeon General's Office. We claim no originality since most of our efforts have been directed toward the practical application of ideas originating elsewhere. The facilities of the department being at the disposal of the officers on duty in the *X*-ray Division of the Surgeon General's Office, most of the

work has been done under their guidance and supervision and any credit that may be due should be placed there.

Aside from the routine reports on intensifying screens, photographic plates, *x*-ray accessories, apparatus and instruments, we have made studies concerning the protective value of lead glass, gloves, aprons, trochoscopic boxes, etc., supplied for use in the army. Following is a list of the special activities completed in the department during the year 1917–1918:

Index File: Pathology—for Instruction
Classification of Bone and Joint Diseases
Pathological and Anatomical Chart for Diagnosis of Bone and Joint Diseases
Description of *x*-ray Pathology of Bones and Joints
Technique for Determining the Size of the Heart from the Roentgenogram by use of the Planimeter
Heart Report
Interpretation of Roentgenograms: Tuberculosis
Method of making Strohl Setting on Portable Unit Table without U. S. Instrument, and also by an adjustable Strohl instrument—Coe
Hirtz Compass by Fluoroscopy without U. S. Adapter—Coe
Method of Finding Distance of Target from Filter on Top of Tube-case—Coe
Report on Para-amidophenol-hydrochloride
Report on Comparative Tests of Developers
Report on the Manufacture and Use of Thorium for Pyelography (Illus.)
Safety Zone for Operator in Fluoroscopic Work
Brief Explanation of Some Defects Noticed in Intensifying Screens—plates
Plans for Illuminating Boxes with Shelves
Portable Developing Box for Use with the Portable *X*-ray Unit—Coe
Scheme Showing Use of the Bedside Unit Operated from the Delco Engine by Making Contact with the Portable Transformer Table—Coe
Photograph Showing Use of Bedside Unit with the Portable Table—Coe
Photograph Showing Use of Portable Fluoroscope and Bedside Unit
Speed Coefficients and Intensifying Screens
Intensifying Screens and Single *versus* Double Screens
Plan for Setting up a Portable *X*-ray Unit.

ROENTGENOLOGICAL SERVICE IN A BRITISH EVACUATION HOSPITAL*

BY CAPT. WALTER C. HILL, M. C., U. S. ARMY

Roentgenologist, No. 9 (Lakeside, U. S. A.), General Hospital, B. E. F.

IN THE British Army, the wounded man normally passes through an Advanced Dressing Station; a Casualty Clearing Station; an Evacuation Hospital; and, if permanently disabled or not fit for duty for some weeks, he goes to a Base Hospital in England.

The type of roentgen ray work in an Evacuation Hospital varies little from that at the Casualty Clearing Station, and during an offensive is identical with that of the Casualty Clearing Station, for many patients at such times come directly from the Advanced Dressing Station to the Evacuation Hospital.

The roentgen ray unit supply consists of induction coil, fluoroscopic table, tube stand, and gas tubes of different types, electricity being supplied from the lighting circuit or storage batteries. The roentgen ray laboratory is located in a room adjoining the operating theatre.

* Prepared for Presentation at the 19th Annual Meeting of the American Roentgen Ray Society, September, 1918.

The scope of work consists principally in localization of foreign bodies, examination of fractures, and of suspected cases of gas gangrene, and study of all types of intrathoracic conditions. Naturally, the amount and character of work varies with the character of the warfare. When there is no fighting, the type of work reverts to that of civil life, and in the Evacuation Hospital, there is little to do. But during a big offensive, the roentgenologist is worked to the limit of endurance and is fortunate if he obtains his eight hours' rest, for the majority of cases operated must first be roentgen-rayed. At these times, one pair of stretcher bearers is utilized to carry cases from the accumulation of patients in the corridors to the roentgen-ray room, and another pair to carry them from the roentgen-ray room to the operating theatre. The top of the roentgen-ray table is removed, and the stretchers placed on the frame, thus saving a considerable amount of time as well as inconvenience to the patient. With the equipment at hand, the roentgenologist must develop a technique that will allow him to examine the greatest possible number of patients, in order to keep a group of tables continuously occupied in the operating theatre, and further to accumulate a surplus of cases to be operated while he is off duty. I have found that the only possible way to accomplish this is to use the fluoroscope in practically all cases for localization of foreign bodies, and to a great extent in other types of work. One does not at all times have the perfect protection which my friend Pfahler has taught us to believe is necessary for our well being, but we surely have as much protection as the medical officer serving with a battalion at the front.

I feel that the roentgenologists coming to France should be well instructed in the use of the fluoroscope, and in working with different types of apparatus, for we shall not all have the good fortune to use one of the very satisfactory roentgen-ray units operating a Coolidge tube. The roentgenologist always holds a position of responsibility, but never of such great responsibility as he holds over here in connection with military surgery. A noted surgeon stated to me recently that he considered the roentgenologist one of the most important members of the war machine today. A portion of his time must be spent in the operating theatre in consultation with the surgeons, but his chief function lies in making quick and accurate examinations of great numbers of wounded. If for lack of time, a large fragment of shell has not been localized for removal and the operation is thus delayed for some hours, a gas gangrene may develop to the point where surgical interference will be futile. To the lack of early, adequate, surgical interference in an Evacuation Hospital can be attributed the majority of deaths from shell wounds.

The greatest number of cases seen by the war roentgenologist are those with shell or bomb fragments—sometimes one, sometimes hundreds to a case. As a rule the small fragments are not localized, unless, because of their anatomical position, they may cause trouble. These small fragments cause so little devitalization of the tissues along their track, that the tissues are able to control the slight amount of infection carried in by the foreign body. A fragment of shell, 1 cm. in diameter or larger, devitalizes to a considerable extent the tissues along its course, and furthermore, acts as a die, cutting and carrying on its distal surface a corresponding sized piece of all the clothes through which it passes, together with the accumulated bacteria. Therefore, the old axiom that "A bullet when it has ceased moving has ceased doing harm" certainly does not apply to these large shell fragments, for in most cases they commence doing harm only some hours after their entrance. They kill because of the amount of infected material they transport into the devitalized tissue.

The type of foreign body depends upon the character of the fighting. Occasionally we find large numbers of shrapnel balls. At other times, most of the cases examined

contain rifle or machine gun bullets. It is quite remarkable how little damage a rifle bullet may do. A sniper was shot in the inner canthos of the right eye, and the bullet was found under the skin of the back of the neck on the right side. Careful search was required to detect the entrance wound. The eyelid was uninjured, the eye perfectly normal, and no ecchymosis present. The patient complained only of the sore spot in his neck.

A bullet may, as we know, travel great distances and also change its course after entering the body, so that an extensive screen examination is necessary to locate it. A British colleague in a neighboring hospital examined an officer who had been shot in the left groin, but the roentgen-ray examination disclosed no bullet in the abdomen or pelvis. The following day signs and symptoms of infarction of the left lung appeared. At autopsy, laceration of the external iliac vein was found, where the machine gun bullet had entered and from whence it had passed on through the circulation, lodging in a branch of the pulmonary artery.

The French give the following classification of gunshot wounds in cases reaching the Advanced Dressing Station:

Head	16.0 per cent.
Chest	10.0 per cent.
Spinal Column	2.6 per cent.
Abdomen	4.0 per cent.
Arm	14.0 per cent.
Forearm	8.0 per cent.
Hand	12.0 per cent.
Thigh	14.0 per cent.
Leg	12.0 per cent.
Foot	6.0 per cent.
Multiple	20.0 per cent.

The percentages in cases coming to the Evacuation Hospital vary somewhat from the above, there being fewer head, chest, and abdominal cases. It will be seen that the greatest number of foreign bodies are found in the extremities, and therefore can be readily localized.

The great majority of foreign bodies in the head are found in the face. Less frequently are foreign bodies other than bullet or shrapnel balls discovered in the brain, for a shell fragment with sufficient force to pass through the steel helmet and skull prevents the patient from reaching the hospital. A relatively small percentage of chest wounds are penetrating, and these usually on the right side, few of the cases wounded in the left side reaching the hospital. Foreign bodies found in the lungs, heart, or mediastinum are almost invariably shell fragments, because bullets or shrapnel balls pass entirely through the chest or lodge in the opposite wall. For accurate localization of fragments within the chest, the most careful fluoroscopic examination is necessary to determine whether a foreign body lies in the lung, pericardium, heart, mediastinum, or in the chest wall; and if in the lung, to determine if possible in which lobe. The roentgenologist must give definite information, for at times it is extremely difficult for the surgeon to locate a foreign body in the chest, even with the ribs widely spread, allowing him to see as well as palpate. In injuries to the abdomen, the foreign bodies are usually found in the walls or in one of the solid viscera, as operative cases of abdominal perforation are cared for in the front areas.

The problem of fractures for the roentgenologist is quite the same as in civil practice. The majority of fractures coming to an Evacuation Hospital are compound, comminuted, or infected. In cases of gunshot fractures of the long bones, the screen method of examination is very satisfactory; a tracing being made from the screen for record and transfer with the patient. Especially is this method of value in busy times when patients are quickly transferred, one advantage being that the tracing is ready when the patient leaves the roentgen-ray room. In cases of suspected simple fractures and fractures of the skull and face, the plate method is more satisfactory.

The roentgenologist can be of great assistance in early diagnosis of gas gangrene before all the cardinal symptoms—such as swelling, discoloration, and crepitation—appear. In this connection, I have found the plate method quite indispensable. Very frequently one finds a single large globule of gas about a foreign body, and upon incision of the part, the pus escapes under pressure. However, these single large globules of gas are apparently formed by ordinary non-virulent types of gas-forming bacteria. Gas gangrene shows a typical picture—very small globules of gas may be seen radiating from the foreign body beneath the sheath of the adjacent involved muscle, and later, throughout all the soft tissues of the part. The roentgenograph is of great value, for the early diagnosis by this means enables the surgeon to limit his operation to thorough dissection of the muscle involved, whereas a few hours later, when all pathognomonic signs of gas gangrene are present, amputation is necessary; and where the trunk is involved surgical interference may be of no avail. I might say in this connection that if a deep wound is cleansed with peroxide, one may obtain a plate quite typical of gas gangrene, for it is remarkable the distance that oxygen bubbles will travel between the muscle sheaths. Frequently, there are cases of apparent early gas gangrene, in which the roentgen-ray examination shows no gas present in the tissue, the physical signs closely resembling gas gangrene having been produced by large interstitial hemorrhage or large clots.

The most interesting part of war roentgenology is the study of intrathoracic conditions. This is true of tuberculosis because there are many recrudescences of old tuberculous lesions due to the hardship and exposure of trench and dugout life. Other such conditions are hemothorax, pneumothorax, abscess of lung, empyema, etc. The stereoscopic plate method is naturally the ideal one for studying these conditions, and is essential for fine differentiation of tuberculous conditions. But war conditions are not ideal conditions, and one may have to depend to a great extent upon the fluoroscope.

I think it is worth while mentioning that I have also given two bismuth meals for stomach examination during my thirteen months' service in an Evacuation Hospital.

In conclusion, I wish to emphasize the fact that the work here is rather typical of all that done in advance of the Base Hospital, so that the roentgenologist who comes to France may have similar experiences. He must not expect ideal conditions for work, nor ideal apparatus with which to work, but must be prepared to do a great amount of work when it comes, by the most advantageous methods available at the time. And again, might I suggest to the teachers of war roentgenology the necessity of instructing their pupils in the manipulation of different types of apparatus, the problem of bone injuries, and the appearance of all intrathoracic conditions, as well as methods of localizing foreign bodies.

USE AND ABUSE OF ROENTGEN RAY TUBES*

BY C. N. MOORE

SCHENECTADY, N. Y.

I FEEL rather as though an apology was due for appearing before a body of trained roentgenologists to speak upon the subject of the use and abuse of roentgen ray tubes. My only excuse for doing so, is the belief that experience gained in the development, manufacture and testing of tubes, together with the examination of tubes returned for repairs, may enable me to be of some service by pointing out the conditions under which tubes were designed to operate. I will mention some of their limitations, and by means of sample tubes and a few simple experiments show some of the results of abuse. In the present emergency, it is highly desirable to conserve and utilize to the utmost degree the tubes which must be transported under such difficulties and for such distances. I hope that nothing I shall say will conflict with what you are being taught in the various schools for military roentgenology. My remarks will apply specifically to the hot cathode type of tube, but will apply in the main to all types.

Turning first to the all-tungsten target tube in the seven-inch bulb—a tube designed for diagnostic work, both roentgenographic and fluoroscopic, and for roentgenotherapy. It is intended to be operated under the following conditions: (1) With voltages as high as that corresponding to a ten-inch parallel spark gap between points, and with currents depending upon conditions to be explained later, and (2) upon apparatus delivering current to the tube. You are all perfectly familiar with the operation of this tube, but I wish to say a few words regarding the conditions just mentioned.

First, in regard to the question of the amount of energy that a tube will carry. In this case, energy may be considered as the product of the milliamperage times the potential (spark gap). Once the target design is fixed, the allowable energy input is determined principally by four things: (1) The target material, (2) the area of the focal spot, (3) the time during which the energy is applied, and (4) the temperature of the target at the time the energy is applied. Of the energy applied to the focal spot, approximately 99.8 per cent is converted into heat, so that the question of the allowable energy input is really a question of the rapidity with which heat can be removed from the focal spot and of the melting point of the target material. The metal tungsten is used today for the target face in practically all tubes. It has a melting point of 3300° C. If this temperature is exceeded, tungsten will melt. The filament in this incandescent lamp is made of tungsten. I am going to raise its temperature above 3300° C. by operating it at a voltage considerably in excess of that for which it was built. As I cut out resistance in series with the lamp, the tungsten becomes hotter and hotter, until finally, at this point where it is white hot, it melts. Probably the worst abuse of the roentgen ray tube is due to a lack of consideration of the fact that tungsten has this definite melting point. Present practice is resulting in repeated melting of the focal spot in many tubes. The molten tungsten vaporizes rapidly in an evacuated space, and deposits in a thin film over the active hemisphere, as is shown by this tube. This mirror-like metal deposit on the inside of the glass should not be confused with the violet coloration which always results when the particular kind of glass used in these bulbs is subjected to prolonged exposure to roentgen rays. This violet color is due to some change taking place within the glass itself and is perfectly harmless. The thin film of tungsten

* Read before the nineteenth annual meeting of The American Roentgen Ray Society, Chattanooga, Tenn., September, 1918.

exerts no appreciable filtering effect upon the roentgen ray, but it does disturb the electrical conditions within the tube. Experiments in the laboratory have shown that a grounded metal wire can be brought up into contact with a clear bulb when the tube is operating, whereas with a tube having a metal deposit inside, such a wire must be moved away a number of inches to avoid puncturing the tube. The metal of the tube stand is usually grounded and the large number of punctured bulbs similar to the one which I am showing you, would be greatly reduced if the practice of blackening bulbs were discontinued. Furthermore, I want to call your attention to the fact that this practice results in no appreciable gain. You may succeed in increasing your roentgen ray production a few per cent thereby, but this is hardly of interest. At the same time you have probably greatly reduced the life of your tube. Properly used, a tube will gradually acquire the deep violet color shown in this tube, which was returned for a trifling mechanical defect after two and a half years of constant use. If used in the same conservative manner, this tube should last many years more.

Just a few words in regard to the other factors involved in the question of allowable energy input. It is obvious that more energy may be applied to a large focal spot than to a small one without exceeding the allowable temperature. For a given size of focal spot, more energy may be applied for a short time than would be possible if the time of application were longer. And finally, for a given size of focal spot, more energy may be applied to a cold target without melting the focal spot than to one that is already hot, because in the case of the cold target, heat will flow away from the focal spot more rapidly.

What I have said so far has applied mainly to roentgenographic work. For continuous operations in roentgenotherapy, the limiting feature is not so much the target as the glass of the bulb. It is possible to get the body of the target so hot that heat radiated from it may cause gas to be driven out of the glass or may even melt the glass. Adequate cooling of the bulb is necessary to prevent this.

I have already stated that the present seven-inch tube with the solid tungsten target was designed to operate upon apparatus delivering rectified current to the tube. It is not designed to operate directly from the terminals of a high tension transformer without the interposition of a suitable rectifying device, or from the terminals of a coil without the use of valve tubes. Operation under these conditions constitutes one of the worst abuses with which we are familiar. Again it is a question of the temperature of the focal spot. Tungsten at a temperature of about 2000° C. begins to emit electrons at an appreciable rate. As a consequence, if a source of alternating potential is applied to the terminals of a tube with the focal spot or any point in the focal spot, at or above this temperature, inverse current will pass through the tube. This inverse current may focus on the glass in the cathode stem, causing cracking and the emission of gas, or it may focus on the glass of the bulb directly below the cathode. It is customary to speak of a tube being punctured by inverse at this point. What really happens is that the inverse current heats the glass locally so that it actually melts, or else sets up strains so that the glass cracks during this or some subsequent operation. After cracking, air rushes in and the electric current traveling along the air current gives the impression that a spark was the cause of the puncture. The presence of inverse is always indicated by green fluorescence at the cathode end of the tube. I am now going to do something which should never be done, I am going to run this tube directly from the terminals of a transformer with no other rectifying device. Within a few seconds from the start you will see green fluorescence appearing in the cathode arm. Now that the target is at a dull red temperature, the focal spot is hotter and you see the green fluorescence

immediately upon closing the switch. The tube has not yet been injured, but if I should continue as I am about to do now, I shall undoubtedly ruin the tube. You see the inverse current focusing now on the glass below the cathode and a moment later so much gas has been evolved that I shall have to discontinue operation of the tube. Subsequent examination of the tube shows that, while cooling, the glass has cracked at the point where the inverse current focused upon it. The same thing would happen on our induction coil. It will also occur on the regular interrupterless machines if the rectifying switch is not set properly.

Turning now to the radiator type of tube which was developed for use in connection with the portable army outfits. This tube is adapted to diagnostic use only, and the allowable energy input is limited to that corresponding to 10 ma. at a five-inch parallel spark gap. For continuous operation in fluoroscopy, the current is limited to 5 ma. It is not suitable for therapy for the reason that it has not been designed to operate at the voltages used in such work and because it will not carry continuously more than one quarter of a kilowatt. The seven-inch tube with no copper in the anode will carry continuously about one kilowatt.

The radiator type tube is so designed that it will rectify its own current and can therefore be operated directly from the terminals of a high tension transformer or a coil. You are all familiar with the manner in which it is used on the portable outfits. It will operate equally well on outfits delivering rectified current, if the limits mentioned above are not exceeded.

I am now going to run a radiator tube on this apparatus taken from a portable outfit, with a current of 10 ma. to demonstrate the behavior of this tube under abuse. The longest roentgenographic exposure is probably not over forty seconds. You will observe from the milliammeter that the tube has remained fairly constant during this time. If, now, I continue running longer without adjusting the filament current, the milliamperage will gradually drop until at the end of two minutes it has reached 8 ma. This falling off in the milliamperage is due to the presence of gas driven out of the copper in the anode by heat. If I set the tube aside, the copper as it cools will reabsorb the gas and the tube will return to its original condition. Because of lack of time, however, I shall have to omit this part of the experiment. I am now going to abuse this tube. I will operate it at 10 ma. until it shows signs of distress. At the end of about four minutes the copper of the target has reached such a temperature that I shall have to discontinue to avoid melting it. Frequently before this point is reached, the tube will show green fluorescence throughout the bulb, owing to the fact that so much gas will have been evolved that further operation is unsafe.

A RÉSUMÉ OF THE ROENTGEN FINDINGS OF TWO HUNDRED AND FIVE CHEST EXAMINATIONS AT A BASE HOSPITAL IN FRANCE*

BY H. E. ALLISON

First Lieutenant, M. C., U. S. A.

FRANCE

DURING the past three months we have made 205 roentgen examinations of the chests of soldiers admitted to this hospital from various parts of the front with either definite or suspected pulmonary affections. Gunshot wounds of the chest, with their various complications, are not included in this paper. The occurrence of a fairly large percentage of normals is explained by the fact that all cases with a history suspicious of tuberculosis were roentgenographed regardless of their lack of objective symptoms and physical signs. As many of the cases were convalescing from influenza and bronchopneumonia, they were classified from a roentgenological standpoint as normal unless the condition was clearly defined on the plate.

Method.—Stereoscopic plates were made on all cases either in the *x*-ray room or at the bedside. When the condition of patients permitted, fluoroscopic examinations were also made.

Interpretation.—Interpretation was made without any knowledge of the patient's symptoms or results of his physical examination. From experience it is my belief that the roentgenologist will have a much lower percentage of error in diagnosis if he will confine himself to what he sees on his plate, rather than be biased by a history which may or may not be authentic, or to lay too great stress on symptoms which may be produced by some condition outside of the chest of which he has no knowledge.

In chests showing changes produced by tuberculosis I have classified as normal all cases showing changes which in the opinion of casual observers are anatomical rather than clinical. Under anatomical tuberculosis I have included: (1) Increase in root shadows. (2) Calcified tubercles. (3) Peribronchial involvement—unless gross and circumscribed or accompanied by mottling. (4) Lessened opacity in one apex as compared with the opposite one, which is generally due either to unequal muscular development or apical pleurisy.

Classification.—In the following table I have included complications found under both conditions, consequently the number of conditions is somewhat in excess of the number of cases examined.

CONDITIONS FOUND

Normal	40
Pulmonary tuberculosis (Parenchymal)	46
Pulmonary tuberculosis (Gross peribronchial)	5
Influenza	58
Pneumonia (Lobar)	12
Pneumonia (Broncho)	13
Empyema	6
Pleural effusion (Serous)	12
Intralobar effusion	3
Lung abscess (Acute)	1
Cardiac hypertrophy	22
Aortic aneurysm	1
Total	219

Of the six empyemas found, four accompanied unresolved pneumonia. In two, the pneumonia had entirely disappeared. Of the twelve serous pleural effusions five were found complicating a definite tuberculosis. In seven cases no lung lesion could be found. All three of the intralobar effusions accompanied a definite pulmonary

*Prepared for the 19th Annual Meeting of the American Roentgen Ray Society, September, 1918.

tuberculosis. The acute lung abscess was postoperative. Of the twenty-two cases of cardiac hypertrophy, eight were found accompanying lobar pneumonia; two accompanying bronchopneumonia; and ten were dependent on valvular disease.

PULMONARY TUBERCULOSIS. — Neither the roentgenologist nor the clinician in army service has the time to give to prolonged study and observation necessary, at times, to determine the activity of a pulmonary tuberculosis. The information the clinician desires from the roentgenologist is: (1) Is tuberculosis present? (2) If so, its character, distribution, and probable activity or non-activity. This information, quickly and accurately given, is of immense value in enabling the clinician to quickly distribute and evacuate his cases.

The definitely active cases are sent before an examining board so that if found unfit for duty they can be returned to the states without unnecessary delay. The borderline cases, where the activity of the process is questioned, may be sent to special hospitals farther back from the front for a period of observation. The definitely non-tuberculous lung conditions such as influenza, resolving pneumonia, etc., are sent directly to convalescent camps.

Whether or not the earliest changes of pulmonary tuberculosis can be demonstrated on the roentgen plate is still a mooted question. Certainly no scientific proof that they cannot be so demonstrated has as yet been advanced. The cardinal points in the roentgen appearance of tuberculosis are: Generally upper lobe, occasionally middle lobe, and practically never lower lobe involvement. Increased bronchial markings leading to the lesion, and parenchymal mottling have all been too clearly emphasized to warrant more than passing mention. The point which I believe needs special emphasis is that peribronchial tuberculosis alone without parenchymal mottling is practically never of clinical significance unless it is gross in amount, clearly circumscribed, and located in the upper lobes. This has been abundantly proved by Heise, Cole, Brown, and others.

INFLUENZA.—The influenza we have encountered in France has been of an unusually severe type. From a standpoint of symptoms and physical signs it has oftimes been impossible to distinguish from tuberculosis. Where bronchopneumonia existed as a complication, blood-streaked sputum, and occasionally, frank hemoptysis persisted over a period of several weeks. Where influenza exists uncomplicated by pneumonia the roentgen appearance is quite typical and easily recognized. It consists of markedly increased bronchial markings throughout the lungs, practically always bilateral and usually more marked at the bases, diminishing in intensity from the bottom up. The hilus shadow is usually increased and the pleural unaffected. When bronchopneumonia exists as a complication the diagnosis is more difficult, but as the pneumonia is usually middle or lower lobe in origin (a region where tuberculosis is rare) they can usually be differentiated. The most difficult problem is to differentiate an influenza infection with an apical bronchopneumonia from an apical tuberculosis. The mottling produced by the two conditions is so very much alike that often we must resort to the time honored custom of watchful waiting to decide which condition is present. The only helpful point I have been able to observe is that in tuberculosis the increase in bronchial markings is usually confined to the affected portion of the lung, while in influenza with bronchopneumonia the bronchial markings are usually increased throughout both lungs. In a certain percentage of cases repeated sets of plates over a period of weeks and even months will have to be made before the diagnosis can be cleared up. We have found the roentgen pictures of influenza quite typical for as long a time as three months after an acute attack.

LOBAR PNEUMONIA. — The roentgen characteristics of lobar pneumonia have

been so thoroughly described in the past that I have nothing to add except to call attention to the fact that lobar pneumonia extending outward from the root of the lung has been quite commonly observed, not only in my short series of cases but in many larger series as well. It is extremely liable to be confused with acute lung abscess, due to its location, and to the fact that the consolidation is so sharply circumscribed instead of gradually shading into the normal lung valuation as is common in lobar pneumonia.

The other conditions observed have in no way varied from previous descriptions of them.

Résumé

1. Parenchymal tuberculosis is generally a clinical disease unless slight in amount and definitely calcified.

2. Peribronchial tuberculosis is not of clinical significance unless sharply localized, circumscribed, or accompanied by mottling of the parenchyma.

3. Uncomplicated influenza gives a typical roentgen appearance.

4. Stereoscopic chest plates furnish invaluable assistance in a Base or an Evacuation Hospital where rapid and accurate distribution and evacuation of cases is necessary.

I wish to express my gratitude to Lieut. Col. Joseph A. Blake for permission to present this résumé and to the Medical Staff of the Hospital for the hearty coöperation they have given in enabling me to follow the cases clinically.

MIDWINTER MEETING OF ROENTGENOLOGISTS

THE Fifth Eastern Midwinter Meeting of Roentgenologists will be held at the Hotel Traymore, Atlantic City, Friday evening and Saturday, January 24th and 25th, 1919.

While the plan which has been so successful in previous meetings will be closely followed it is desired that the discussion topics be more limited. For instance, that in place of a general topic "Bone Lesions," several subtopics be chosen, such as "Difficulties of Diagnosis Between Osteomyelitis and Sarcoma." What are the early signs of malignancy in pre-existing bone cyst? Is diagnosis possible between tuberculous arthritis and that caused by other specific infections? That is, the limitation rather than generalization of discussion.

The staging of a successful meeting at this time is of course beset with unusual difficulties, and other demands upon the correspondent's time render it almost beyond accomplishment. Every possible assistance is therefore solicited along three lines: (A) Furnishing addresses of men who should attend. (B) Suggestions as to program and topics. (C) (Especially important.) Volunteers who will agree to discuss specified topics.

We believe that you value these meetings. Show that you do by giving us a lift over this hard place.

David R. Bowen, M.D.,
Correspondent.
235 So. 15th St.
Philadelphia.

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FRATERNAL GREETINGS

LETTERS FROM FRENCH ROENTGENOLOGISTS TO MEMBERS OF THE AMERICAN ROENTGEN RAY SOCIETY ON THE OCCASION OF THE NINETEENTH ANNUAL MEETING, SEPTEMBER, 1918

From Major R. Ledoux-Lebard, Chief of Radiologic Service, Hospital Descartes, Tours, France

GENTLEMEN:

Words fail me to thank you adequately for your kind invitation to be present at this meeting of your society and for the great honor of being elected an honorary member. You may well believe me if I state that nothing could have given me a greater pleasure than to be sitting among you today and to become personally acquainted with all the eminent roentgenologists who compose this society and have so extensively contributed to the development of our specialty.

But at this crucial moment of the war, when my masters, my colleagues and my assistants are all giving the best of their efforts to the aid of the wounded and to the support of our great cause, I have felt that I could not leave France and my work here, and that I had to give to my country my share of effort—however small and inefficient it may be.

As I have the honor of being among those chosen to continue over here in France the instruction of American war radiologists who, with your armies, come to our aid, I am constantly in mental communion with all of you and this coöperation with your wonderful work has given me, and still daily gives me, the greatest joy I have felt since the war began. I am only too well acquainted with my own limitations but I hope that they may be to some extent overlooked in consideration of the sincerity of my endeavor to impart to the men entrusted to my care the love of our still rising specialty and whatever small knowledge of war radiology I may have acquired. And let me tell you this: They are a fine lot of men, all of them, with the true spirit in them!

Let me hope that you will not resent my not having accepted this time your invitation which I appreciate to its full value and for which I cannot sufficiently express my gratitude. If, some day, in one of these coming years, I have the privilege of being asked again among you, it

would be my most intense joy to come and to thank you, as well as to express my admiration, for the splendid work that you have achieved here and for the extraordinary task surmounted, against almost incredible difficulties, by the men who have come over to France.

(Signed) R. LEDOUX-LEBARD.

From Major Haret, Director of the Radiologic Service of the French Armies and the Civil Jurisdiction

GENTLEMEN:

My friend, Lieutenant Colonel Case, Chief of the Radiological Service of the American Expeditionary Forces, has paid me the great honor of requesting me to be the spokesman for the French Radiological Service.

In our rôle as specialists, rather firm bonds had already united us before the beginning of the terrible drama which has been enacted for the past four years on our northern and eastern frontiers. The number of our American confrères had been growing each year in the midst of the Radiological Society of France; we had been reading and commenting with the greatest interest on the innumerable contributions developed in your laboratories.

Across the ocean, a current of reciprocal sympathy had been established upon a scientific foundation. One could hardly open a book, read a thesis, or look through an article in a journal without seeing mentioned there, with credit, the efforts of as many American as French specialists; and this was only one of the slight evidences of the many bonds which united our minds as well as our hearts.

But it was destined that this union should become even more firm. Two peoples of the same mentality were bound to be interested in the same ideals. Therefore, from the very first days of this frightful war, we were able to detect a movement gradually developing within you which was certain before long to range you by our sides.

Barely a year has gone by since you determined to enter into the struggle, and behold the resplendent appearance today of our sister republic!

Your formidable power has come to the help of France. Your men, your wealth, your science—everything has been offered to us. In every sphere your activity is manifest. You are not content with merely bringing up engines of destruction against our common enemy. You add to them the most highly developed means for the treatment of the heroes who are pouring out their blood for this sublime cause. My duties in the French Service for Military Hygiene have given me an opportunity to see the entire extent of the aid which you have brought us in the radiological field. Indeed this branch of roentgen diagnosis is perhaps the one which has been most developed since the beginning of hostilities. The number of roentgenological posts has multiplied a hundredfold since August 1914. Indeed no surgeon would consent to be without the roentgenological examination unless actually in the field. In the past year especially, the improvements have been tremendous, both as regards material and organization. It may be stated that every wounded man is examined systematically, from the very beginning of his treatment, by means of the *x*-rays.

It is therefore with a most profound joy that we have observed the intimate relation which exists between your roentgenological service and ours, convinced that it would bear important fruits. Indeed we have already begun to gather these fruits. American roentgenologists have already been chosen for several offensive attacks. We have perfected our methods together; we have continually improved our material, actually borrowing from one another various ingenious novelties. This is a labor, pursued with the most complete harmony, for the purpose of relieving the wounded.

Permit me, my dear colleagues, to tender you at the beginning of your meeting the heartfelt greetings of the French Ra-

diological Service. We shall never forget the magnificent spirit with which you have helped us during these terrible trials. And when the day of victory shall shine forth, united in joy as we have already been in suffering, the French radiologists will be proud to share with the radiologists of America the laurels which they will have earned in common at the beds of the wounded, in an intimate union of right and justice.

Long live the American Roentgen Ray Society!

(Signed) HARET.

From Dr. A. Béclère, of The Academy of Medicine of Paris, Former President of The Society of Medical Radiology of France

TO THE AMERICAN ROENTGEN RAY SOCIETY:

As an honorary member of the American Roentgen Ray Society I am happy and proud of the honor which you have paid me. My only regret is not to be able, at this annual meeting, to express my gratitude to you in person. The war has suspended the meetings of the French Society of Medical Radiology, since all the members have been mobilized and are scattered, some in the ambulant laboratories of the army zone; others in the fixed laboratories of the rear zone. For this reason they have not been able to give their dean the formal mission of transmitting the friendly greetings of our society. It is therefore in my own name that I am writing to you. I feel, however, that I am the spokesman, not only of my colleagues of the Society of Medical Radiology of France, but also of all French radiologists without exception.

In this reunion of exclusively medical and scientific men I shall say only a few words in accord with the elevated ideals that you are following.

To our medical eyes, in war as in peace, the wounded and the sick appear merely as suffering human beings, that is to say as sacred beings; and without asking them on which "side of the fence" they are fighting, we compel ourselves, to our utmost, to bring our help to all of them.

To our scientific eyes, all human knowledge appears like a collective edifice, always in process of construction, but never finished, to which innumerable workers of all times and of all countries have brought their little stones. In the field which we are cultivating, that of medical radiology, to how great a number of investigators are we not indebted for our knowledge and our actual power?

It was in France, at the end of the 18th century, that Abbé Nollet, with the aid of the newly invented pneumatic pump, first rarefied the atmosphere inside a glass tube, and passed through it the discharge from a static machine, which was also a recent invention.

This "electric egg" as he called it contained in germ a whole series of surprises then entirely unsuspected. From that egg developed successively: In Germany the discovery of the cathode rays by *Hittorf;* in England their profound study by *Crookes;* then in Germany the discovery of the *x*-rays by *Roentgen;* and almost immediately afterwards in France, the discovery of the rays of uranium by *Henri Becquerel*, soon followed by the discovery of the marvellous radium by *Pierre Curie* and *Madame Curie.* Finally, in the United States, a discovery by your celebrated *Edison* became the point of departure for a revolution which was actually accomplished in medical radiology, of which the *Coolidge tube* is the wonderful result. It is not merely a change in instruments. New horizons are being opened in the field of radiodiagnosis, on account of the remarkable ease of technique; and even more is offered in the field of radiotherapy, because of the production on a large scale of more penetrating rays, some even as penetrating as certain of the gamma rays of radium. We have reason to hope for therapeutic successes much more numerous, more rapid, and more extraordinary than those obtained up to the present.

From the "electric egg" of the Abbé Nollet to the Coolidge tube, what a course has been traversed—at the cost of what efforts, of what struggles; and, although I have limited myself to the mention of only a few names, how numerous and to what a number of different countries belong the scholars who are responsible for this progress, the common heritage of humanity.

The physicians to whom we owe the perfection of radiodiagnosis and of radiotherapy are even more numerous. They are scattered over even a greater number of countries. I shall not attempt to mention even the most famous of them, even limiting myself in the enumeration of the American physicians whose part has been so great in the progress of medical radiology. Permit me, however, to pay my respects to one of the first pioneers in this new field, one whose treatise published at the very beginning of this century taught me very much; a man to whom I have been bound by a firm friendship for the past sixteen years—Doctor Francis H. Williams of Boston.

Thus the progress of Science and of Medicine is the result of a collective endeavor, of an international effort. As has been said, science has no country.

But in the words of our immortal Pasteur we hasten to add, and you will no doubt repeat with us, "if Science has no country, at least *men of science* should have one."

To the natural sentiment of love which every man feels for his native land is added, for you and for us, a just feeling of common pride, since the soldiers of our two lands are fighting side by side for the same ideal; and are heroically pursuing a contest whose issue (certain, now, thanks to your arrival) will be the legitimate triumph of right over might.

This fraternity of arms has of necessity again sealed the brotherly union of medical radiologists, American and French. My keenest wish is that in the future this union may become ever firmer and more intimate.

Full of admiration and of gratitude towards the great American republic and its illustrious president, I offer you from the depths of my heart the following sentiments:

Long live the United States of America!

Long live the American physicians!

Long live the American Roentgen Ray Society!

(Signed) A. BÉCLERE

Major of the 1st Class, Chief of the Central Service of Radiology, of the Military Government of Pons

Editorial Correction

Concerning article on "Roentgen Ray Protective Materials" by W. S. Gorton, Ph.D., appearing in the October, 1918, number of THE AMERICAN JOURNAL OF ROENTGENOLOGY:

NOTE—Experiments made since the article "Roentgen Ray Protective Materials" was written have shown that the large part of the effect therein attributed to a very soft x-radiation from the lead glass, when subjected to x-rays, is in reality due to a luminescence of the glass.

ROENTGENOLOGISTS ASSIGNED TO MILITARY SERVICE

OVERSEAS

Alleman, Geo. Ellsworth, Lt.	Evacuation Hospital No. 8
Allen, Lewis G., Lt.	
Allison, R. G., Lt.	
Angell, F. C., Lt.	" " " 6
Annadown, Paul V., Lt.	Base Hospital No. 7
Antell, Leon, Lt.	
Aronson, Barnett, Lt.	Evacuation Hospital No. 9
Ash, Ray C., Lt.	Base Hospital No. 61
Aspray, Jos., Capt.	Mobile Hospital No. 102
Aull, John, Lt.	Base Hospital No. 11
Bachmann, M. H., Lt.	" " " 52
Bailey, Clyde L., Lt.	" " " 42
Baird, Jos. C., Lt.	
Baun, Wm. D., Lt.	Evacuation Hospital No. 26
Beard, A. H., Lt.	Base Hospital No. 26
Beardsley, F. A., Lt.	
Beatty, John R., Capt.	Evacuation Hospital No. 22
Beaudet, E. A., Lt.	
Beitsch, Wm. F., Capt.	
Bell, Alfred L. L., Lt.	Base Hospital No. 90
Bell, Fred H., Lt.	
Beller, Raymond C., Lt.	" " " 32
Bendick, Arthur J., Capt.	" " " 3
Benson, A. L., Lt.	
Bernstein, Benj. M., Lt.	" " " 71
Birkelo, Carl C., Lt.	" " " 69
Blackburn, A. B., Lt.	
Blythe, Vernon, Capt.	" " " 69
Bonoff, Karl M., Lt.	" " " 114
Boone, W. H., Lt.	" " " 103
Borzell, F. F., Capt.	" " " 38
Bowie, E. R., Lt.	" " " 24
Bowman, Wm. B., Capt.	" " " 114
Box, Thos. T., Lt.	" " " 43
Bradford, Duke C., Lt.	Evacuation Hospital No. 24
Bragg, Jesse L., Capt.	" " " 34
Branower, Jacob, Lt.	Base Hospital No. 131
Breese, Floyd P., Lt.	" " " 87
Bridenbaugh, J. H., Lt.	
Broemser, Milton A., Lt.	" " " 88
Bromer, R. S., Capt.	" " " 34
Brons, Wm. C., Lt.	Evacuation Hospital No. 49
Brown, Robert D., Capt.	Base Hospital No. 102
Bruorton, Oscar L., Lt.	
Bryant, Frank A., Lt.	
Buchanan, Edwin P., Lt.	
Buckner, Wm. F., Lt.	" " " 93
Burg, Walter A., Lt.	Evacuation Hospital No. 17
Burns, Ira D., Lt.	
Burkholder, John L., Capt.	Base Hospital No. 24
Burnett, H. W., Lt.	Evacuation Hospital No. 16
Butler, Frank E., Lt.	Base Hospital No. 94
Byrnes, John P., Lt.	
Cabot, Vernes S., Lt.	Evacuation Hospital No. 9
Cade, W. H., Lt.	
Campbell, Raymond F., Lt.	
Cantrell, Thos. D., Lt.	Base Hospital No. 11
Carney, Harold E., Capt.	
Carroll, P. M., Lt.	" " " 44
Case, Iverson C., Lt.	
Case, James T., Lt. Col.	Headquarters, A. E. F.
Caylor, Claude C., Lt.	Base Hospital No. 41
Chester, Walter S., Lt.	" " " 59
Chidester, Hugh, Lt.	" " " 67
Christensen, J. R., Lt.	Evacuation Hospital No. 15
Christie, A. C., Lt. Col.	Headquarters A. E. F.
Clair, Jean B., Lt.	Base Hospital No. 76
Clark, James J., Lt.	" " " 74
Climan, Max, Lt.	" " " 60
Clinton, R. S., Lt.	Evacuation Hospital No. 4
Coffin, W. K., Lt.	" " " 28
Cohen, Leon Sclis, Lt.	
Colcher, Abraham E., Lt.	" " " 36
Cole, Lewis G., Maj.	General Hospital No. 1
Coleman, Oscar E., Lt.	" " " 4
Conley, Bernard M., Capt.	Base Hospital No. 54
Cook, Orrin S., Lt.	" " " 47
Corniea, Albert D., Lt.	" " " 67
Corvese, Anthony, Lt.	
Covington, James M., Capt.	" " " 35
Crosby, Leonard G., Capt.	" " " 29
Currin, F. W., Lt.	
Davidson, S. C., Lt.	
Davis, Albert B., Major	" " " 76
Davis, Ernest L., Major	" " " 91
Davis, Fred W., Capt.	" " " 85
Davis, R. A., Lt.	" " " 37
Davis, S. G., Lt.	
Deming, Ralph, Lt.	" " " 62
Deer, John S., Lt.	" " " 43
Deweese, E. R., Lt.	" " " 55
Dewey, Lorenzo S., Lt.	
Dickinson, Ezra P., Lt.	" " " 95
Diveley, Rex L., Lt.	" " " 28
Drury, Roy F., Lt.	" " " 52
Elias, F. J., Lt.	" " " 18
Ellsworth, S. W., Capt.	" " " 116
Engel, Wm., Lt.	
Engesather, John A. D., Lt.	" " " 63
Epperson, Paul E., Lt.	" " " 158
Epstein, Irving, Lt.	
Evans, John, Lt.	" " " 42
Ewing, Leslie H., Lt.	" " " 68
Fagone, Peter G., Lt.	
Favour, Richmond, Jr., Lt.	
Fletcher, Frederick P., Lt.	" " " 62
Flynn, James M., Capt.	" " " 19
Ford, Charles, Capt.	" " " 77
Frankhauser, Agnew F., Lt.	
Frost, Earl J., Lt.	Base Hospital No. 72
Feldman, Maurice, Lt.	
Ferguson, Everett R., Lt.	" " " 95
Fetter, Earl W., Lt.	" " " 64
Firebaugh, T. C., Capt.	" " " 157
Fitzgerald, Chas. A., Lt.	Evacuation Hospital No. 25
Garnjobst, J. H., Lt.	Base Hospital No. 98
Geyer, C. W., Capt.	" " " 86
Gillis, James P., Lt.	
Gilmore, W. H., Capt.	Mobile Hospital No. 103
Girvin, Richard B., Lt.	Base Hospital No. 53
Given, M. A., Lt.	Evacuation Hospital No. 14
Glenn, Wm. S., Jr., Lt.	Base Hospital No. 116
Goin, L. S., Lt.	" " " 116
Gold, Louis, Lt.	General Hospital No. 1
Goss, Harold M., Lt.	Evacuation Hospital No. 21
Goss, Harry L., Lt.	Base Hospital No. 127
Grant, Arthur S., Lt.	Evacuation Hospital No. 26
Grimm, H. W., Lt.	
Gaillard, Samuel S., Lt.	

Hall, Herbert W., Lt.
Hand, J. D., Lt.
Harris, Charlton S., Lt.
Harris, Clarence P., Lt.
Hawes, Geo. F., Lt.
Heatley, J. E., Lt.
Hecker, Wm. Capt. — Base Hospital No. 107
Henschen, Gustave E., Lt.
Hermann, Wm. G., Lt.
Herrmann, Carl B., Lt. — Evacuation Hospital No. 24
Hickey, Preston M., Major — Headquarters, A. E. F.
Hodges, Fred M., Capt. — Base Hospital No. 45
Hoffmeier, F. N., Lt. — Evacuation Hospital No. 17
Holeton, A. J., Lt. — " " " 29
Holmes, Ralph W., Capt. — " " " 12
Hood, Philip G., Capt. — Base Hospital No. 106
Hook, Sam W., Lt. — " " " 88
Horowitz, Jos., Lt.
Horrigan, Arthur J., Capt. — " " " 53
Hotchkiss, Walter K., Lt. — " " " 72
Howard, J. C., Lt. — " " " 51
Howard, Wm. P., Lt. — " " " 33
Hudnutt, Orrin D., Lt. — " " " 31
Hull, Logan E., Lt.
Hurlbut, S. P., Lt.
Ingalls, Stanley S., Lt. — " " " 161
Ingber, Irving S., Lt. — " " " 159
Jaches, L., Major — Replacement Unit No. 1
Jacobs, Alexander W., Lt. — Base Hospital No. 85
James, Jesse, Lt. — " " " 98
Janes, B. F., Lt.
Jenkins, Wm. F., Lt. — " " " 89
Jenkinson, E. L., Lt.
Johannes, E. W., Lt.
Johannessen, Carl J., Lt.
Johns, M. W., Capt. — Base Hospital No. 48
Jones, Harry O., Lt. — Replacement Unit A.
Judkins, C. L. M., Lt.
Kaminski, Zeno L., Lt. — Base Hospital No. 69
Kann, U. S., Capt. — Evacuation Hospital No. 16
Kariher, H. C., Lt.
Kaufman, Julius, Lt. — " " " 30
Kelley, Jacob S., Lt. — " " " 10
Ketcherside, Harry, Lt.
Kirk, Chas. H., Lt. — " " " 12
Kirkham, Judd, Lt. — Base Hospital No. 29
Kirwin, Thos. J., Lt. — Evacuation Hospital No. 5
Kitterman, Peter G., Lt. — Base Hospital No. 78
Knapp, John C., Lt. — " " " 40
Kortwright, Warren P., Lt. — " " " 35
Krupp, David D., Lt. — " " " 92
Lambert, John H., Capt. — " " " 7
Landes, W. L. S., Lt.
Laughlin, Thos. F., Lt. — " " " 70
Law, Frederick M., Major — " " " 115
Law, Wm. P., Lt. — " " " 56
Leach, Austin F., Lt. — " " " 92
Lebendig, Abraham, Lt. — " " " 86
Ledbury, J. W., Lt.
Levey, Simon A., Lt. — Evacuation Hospital No. 21
Lindsey, John H., Capt.
Little, D. E., Lt. — " " " 33
Livingood, John E., Lt.
Lockwood, Ira E., Lt. — " " " 1
Long, J. P., Lt.
Lowe, A. L., Capt.
Lupton, Earl Lane, Lt. — Base Hospital No. 47
MacRae, John B., Capt. — " " " 54
McCall, A. C., Lt. — " " " 65
McCampbell, Herbert H., Capt. — Mobile Surgical Unit
McCaskey, Francis H., Lt.
McCullough, Clarence J., Lt. — Evacuation Hospital No. 31
McCullough, T. L., Lt.
McEwen, H. B., Lt. — Evacuation Hospital No. 13
McGrath, Earl F., Lt. — Base Hospital No. 79
McHenry, R. K., Lt.
McKenna, John J., Capt.
McMillan, Thos. M., Lt. — " " " 58
McNamee, E. P., Lt.
Mackay, Wm. H. G., Lt. — " " " 66
Mackey, D. E., Lt. — " " " 115
Magruder, L. F., Lt. — " " " 41
Malone, F. F., Lt.
Marsh, Chester A., Lt. — Evacuation Hospital No. 27
Mason, J. B., Capt. — Base Hospital No. 108
Mashburn, N. C., Lt.
Maver, Wm. W., Lt. — " " " 1
Menees, Thos. O., Lt. — " " " 13
Mensch, Max, Lt.
Merritt, E. A., Major
Metz, A. R., Lt. — " " " 13
Meyer, Keith T., Lt.
Meyer, M. F., Lt. — " " " 91
Mick, W. H., Capt. — Evacuation Hospital No. 2
Miller, Byron Y., Lt. — Base Hospital No. 77
Miller, Chas. M., Lt. — " " " 80
Miller, Fred McK., Lt. — Evacuation Hospital No. 23
Miller, J. E., Lt.
Miller, Jas. L., Lt. — Base Hospital No. 83
Moir, Chas. L., Lt. — " " " 14
Monnich, Walter A., Lt.
Moon, Alexander C., Lt.
Moore, A. B., Lt. — " " " 26
Morrow, Robt. J., Lt. — " " " 89
Mulligan, Peter B., Lt.
Nichols, Bernard H., Lt. — " " " 55
Odea, Patrick, Lt. — Replacement Unit A
Ogburn, H. H., Lt. — Base Hospital No. 65
O'Reilly, Thos. W., Capt. — Evacuation Hospital No. 7
Osmond, John D., Capt. — " " " 26
Ostrowsky, Herman, Lt. — Base Hospital No. 90
Owen, Arthur K., Capt.
Owen, Gilbert V., Capt. — " " " 35
Palmer, Dorwin L., Lt. — " " " 46
Palmer, Lester J., Capt. — " " " 58
Parson, Russell C., Lt. — Evacuation Hospital No. 13
Paul, Burton E., Lt.
Pedersen, H. C., Lt. — Base Hospital No. 131
Pence, John R., Lt. — " " " 82
Perkins, Roy S., Lt. — " " " 51
Perry, Gentz, Capt. — " " " 87
Peters, Chester M., Lt.
Pierce, Willard R., Lt.
Pindall, Earl L., Lt.
Poole, Chas. Henry, Lt.
Portmann, Ursus V., Capt. — " " " 99
Post, Jos. W., Lt.
Powers, R. A., Lt. — " " " 104
Prince, N. C., Capt. — Mobile Surgical Unit
Ray, W. B. G., Capt. — Base Hospital No. 27
Rayle, Albert A., Lt. — " " " 99
Rea, M. O., Lt. — " " " 102
Reed, Chas. B., Capt.
Reed, L. V. H., Lt. — Evacuation Hospital No. 19
Reeds, W. A., Lt. — Base Hospital No. 109
Reid, Robt. W., Lt. — " " " 25
Rendich, Richard A., Capt. — " " " 37
Rhudy, B. E., Lt.
Rhyne, S. A., Lt. — " " " 46
Roberts, Douglas J., Lt. — " " " 57
Roen, Paul B., Lt.
Rogers, A. E., Lt. — Evacuation Hospital No. 16
Roland, M. M., Lt. — " " " 18
Ross, H. M., Lt.
Rowe, Edw. W., Capt. — Base Hospital No. 49
Rowell, Edward E., Capt. — " " " 44
Royal, Warren M., Lt. — Replacement

Rudasill, Chas. L., Lt.	
Ruff, F. R., Lt.	
Ruggles, Howard, Capt.	Base Hospital No. 30
Rush, Weaver A., Capt.	" " " 81
Ryan, James A., Lt.	" " " 40
Salter, Oscar E., Lt.	
Sansing, Campbell, Lt.	" " " 71
Sargent, Wm. H., Capt.	
Saylin, Jos., Lt.	" " " 78
Sharpe, Abraham M., Lt.	Evacuation Hospital No. 32
Shearer, John S., Major	Headquarters, A. E. F.
Sheldon, Francis B., Lt.	Base Hospital No. 56
Shellito, J. C., Lt.	
Sheppard, Cyril E., Lt.	" " " 82
Sherman, Herbert De G., Lt.	Mobile Surgical Unit
Shreffler, A. R., Lt.	
Siebeneichen, Hugo A., Lt.	Base Hospital No. 110
Sinclair, Fayette A., Lt.	" " " 49
Singer, John J., Capt.	
Skinner, E. H., Capt.	" " " 28
Smart, Chester L., Lt.	
Smith, Elmer M., Lt.	
Smith, Eugene A., Capt.	" " " 22
Snider, Sam H., Lt.	" " " 28
Snow, Henry, Jr., Lt.	" " " 96
Spangler, Davis, Lt.	
Squires, Jas. W., Capt.	" " Yale Unit
Steiner, Jos. M., Capt.	" " No. 15
Stephens, Jamie D., Lt.	
Sterne, Henry P., Lt.	" " " 75
Stevens, Neil C., Lt.	Evacuation Hospital No. 23
Stewart, James E., Lt.	
Stewart, R. A., Lt.	
Stofer, E. S., Lt.	Base Hospital No. 14
Strahl, Milton I., Lt.	" " " 48
Strait, Bernard S., Lt.	Evacuation Hospital No. 19
Sturr, R. P., Lt.	
Swan, Guy H., Lt.	Base Hospital No. 38
Swanson, J. T., Lt.	
Tabb, John L., Lt.	
Teperson, H., Irving, Lt.	Evacuation Hospital No. 11
Thames, Eugene, Lt.	Base Hospital No. 81
Thatcher, Geo. I., Capt.	" " " 60
Thewlis, Malford W., Lt.	
Thomas, E. P., Lt.	Base Hospital No. 3
Thompson, A. W., Lieut.	" " " 23
Thompson, Harold B., Lt.	" " " 50
Thompson, Jas. C., Lt.	Replacement
Tompkins, Chas. R., Lt.	Evacuation Hospital No. 28
Tracy, J. Ross, Lt.	
Troxler, W. E., Lt.	Base Hospital No. 50
Turlington, H. C., Lt.	
Tyson, Ralph M., Lt.	" " " 38
Underhill, Chas. S., Lt.	Replacement
Van Korb, Wm., Capt.	Evacuation Hospital No. 27
Van Sweringen, Walter, Capt.	Base Hospital No. 84
Wahl, Edward W., Lt.	
Wainscott, Clyde E., Lt.	
Walker, Wallis, Lt.	Evacuation Hospital No. 11
Waller, Constantine P., Lt.	Base Hospital No. 128
Ward, James, Capt.	" " " 105
Watts, Wm. B., Lt.	
Weaver, Louis S., Lt.	Evacuation Hospital No. 14
Webb, J. A. H., Lt.	Base Hospital No. 61
Wellman, Graham O., Lt.	Evacuation Hospital No. 20
Wentworth, A. J., Lt.	Base Hospital No. 80
Wentz, M. C., Lt.	
Whitaker, Ben T., Lt.	" " " 63
Whitehead, L. J., Lt.	" " " 19
Wiatt, Robert G., Lt.	" " " 70
Wilcox, Clark A., Lt.	" " " 160
Wiley, Louis R., Lt.	Evacuation Hospital No. 9
Wilkinson, Boyd E., Lt.	" " " 15
Williams, James Neal, Lt.	Base Hospital No. 22
Wilson, E. T., Lt.	
Wiltrout, Irving G., Lt.	" " " 83
Witter, Calvin B., Lt.	Evacuation Hospital No. 20
Woisard, Jos. I., Lt.	Base Hospital No. 93
Woodall, Chas. W., Capt.	" " " 42
Wooding, Charles Edward	Evacuation Hospital No. 35
Woods, C. E., Lt.	Unit "I"
Woolsey, H. U., Lt.	Base Hospital No. 84
Wrenn, Frank, Lt.	
Wronker, Harry, Lt.	" " " 79
Wyatt, Jos. Harrison, Lt.	Mobile Hospital No. 100
Zimmerman, Geo. A., Lt.	Evacuation Hospital No. 49
Zulick, J. D., Capt.	Base Hospital No. 20

UNITED STATES

Alguire, Alden, Capt.	General Hospital No. 13
Anthony, Jos. E., Lt.	Base Hospital, Brownsville, Texas
Ashbury, Howard E., Major	Army Medical School, Washington, D. C.
Baetjer, F. H., Major	Johns Hopkins University
Baumgarten, Roy C., Lt.	Base Hospital, Camp Travis, Texas
Belden, Webster W., Lt.	General Hospital No. 10
Bethea, W. R., Capt.	Camp Shelby, Hattiesburg, Miss.
Blaine, Edw. S., Capt.	Camp Greenleaf, Ga.
Boice, Ralph H., Lt.	Camp Stuart, Va.
Bowers, S. C., Capt.	Camp Custer, Mich.
Brown, Percy, Major	General Hospital No. 10
Brown, Samuel, Lt.	Chillicothe, Ohio
Calloway, Fas. T., Lt.	Camp Gordon, Atlanta, Ga.
Carter, R. A., Lt.	Base Hospital, Ft. Sill, Okla.
Chandler, O. B., Capt.	Camp Dodge, Ia.
Childs, Donald S., Capt.	General Hospital No. 12
Cook, Albert G., Lt.	Ft. Omaha, Nebraska
Cooper, George H., Lt.	Base Hospital, Ft. Riley
Cooper, Jesse R., Lt.	Camp Merritt, N. J.
Copeland, Norman, Lt.	" Cody, N. M.
Cornman, Leighton R., Capt.	Camp Grant, Ill.
Cummings, E. S., Lt.	Fort Riley, Kans.
Damron, J. E., Lt.	Payne Field, West Point, Miss.
Davis, Charles J., Capt.	General Hospital No. 11
Dean, Horace B., Lt.	Linda Vista, Cal.
Dewey, James E., Lt.	Mobile Unit No. 101
Diemer, F. E., Capt.	American Lake, Wash.
Dunham, H. K., Capt.	General Hospital No. 19
Eckles, Samuel H., Lt.	Camp Hancock
Edwards, J. Bennett A., Capt.	" Dix
Eide, Alfred T., Lt.	General Hospital No. 22
Ferguson, Albert B., Lt.	" " " 4
Fickessen, W. R., Capt.	" " " 16
Finney, Guy A., Lt.	Base Hospital, Camp Jackson
Fishel, C. R., Lt.	Ft. Snelling, Minn.
Fitzpatrick, C. M., Lt.	Ft. Des Moines, Ia.
Gariss, Jos. L., Capt.	Camp Sherman, Ohio.
George, A. W., Major	" Devens, Mass.
Goldstein, Theo. P., Lt.	" Morrison, Va.
Greaves, Harrison A., Capt.	Hazelhurst Fld., Mineola, L. I.

Griggs, John B., Capt.	General Hospital No. 19
Guthrie, Michael B., Lt.	Camp Doniphan, Okla.
Harris, S. B., Lt.	Ft. Oglethorpe, Ga.
Hawkins, E. L., Lt.	Camp Sevier
Hawks, John D., Lt.	" Custer
Herendeen, Ralph E., Lt.	Bellevue Medical College, N. Y.
Herrmann, E. R., Lt.	Ft. Thomas, Ky.
Hirsch, J. Harry, Lt.	Walter Reed Gen. Hospital
Honeij, James A., Lt.	Army Hospital, New Haven, Conn.
Hoyt, Benjamin F., Capt.	Camp Johnson, Fla.
Johnson, Russell M., Lt.	" Humphreys, Va.
Johnson, Stuart C., Capt.	" Taylor, Ky.
Johnston, Geo. C., Lt. Col.	Surgeon General's Office
Jones, Z. G., Lt.	Fort Sam Houston, Texas
Kaigha, Chas. B., Lt.	General Hospital No. 8
Kail, Carl, Lt.	Hot Springs, N. C.
Kelley, Jas. F., Lt.	Camp Grant
Kennison, Wm. H., Lt.	Ft. Slocum, N. Y.
Kirklin, Byrl R., Lt.	Fort Bayard
Koloord, Theodore, Lt.	Camp Upton
Lanier, Leon, M., Lt.	" Pike, Ark.
Levering, J. Walter, Lt.	Oglethorpe
Le Wald, L. T., Major	New York, instructor
Liss, I. Edward, Lt.	General Hospital No. 16
Lutz, J. Fletcher, Major	" " " 2
MacRae, Raymond D., Lt.	Camp Lewis
McDeed, Winfield G., Capt.	" Lee
McKinney, J. T., Lt.	Emb. Hospital, Newport News, Va.
McLean, Guy M., Lt.	Ft. Monroe, Va.
Manges, Willis F., Lt. Col.	Camp Greenleaf, Ga.
Margulies, A. C., Lt.	General Hospital No. 9
Marshall, H. L., Capt.	Camp Meade
Merrill, Benj. E., Lt.	Post Hospital, Ft. Sill, Okla.
Ming, Chas. M., Lt.	Ancon Hospital, Ancon Canal Zone
Moffatt, F. J., Lt.	Camp Dodge
Moore, Jas. M., Lt.	" Lewis
Morgenlauder, Aaron M., Lt.	General Hospital No. 9
Newcomet, Wm. F., Capt.	Camp Gordon
Nims, Chas. H., Lt.	Alexandria, La.
Noble, Robert P., Lt.	Base Hospital, Camp Kelly, Texas
Nutt, G. S., Lt.	Base Hospital No. 97
Oechsli, A. B., Lt.	Jefferson Barracks
Palmer, Myron B., Capt.	Surgeon General's Office
Parker, Jesse O., Lt.	Camp MacArthur, Texas
Peden, Jos. C., Lt.	Base Hospital, Camp Zachary Taylor
Peters, Chas. E., Lt.	Camp Fremont, Cal.
Philips, Herman B., Lt.	" Mills
Podlasky, Harry, Lt.	General Hospital No. 1
Pomeranz, M. M., Lt.	Camp Lee
Postlethwaite, Frank McC., Lt.	" Douglas, Arizona
Powell, Eugene V., Capt.	" Sherman
Priest, W. M., Lt.	" Pike, Ark.
Robinson, R. V., Capt.	" Greenleaf, Ga.
Roepke, H. F., Lt.	" " "
Rogers, Lewis L., Lt.	General Hospital No. 20
Ronayne, F. J., Capt.	U. S. War Dispensary
Ryder, O. A., Lt.	Jackson Barracks, La.
Samuel, Ernest C., Cont. Surgeon	Walter Reed General Hospital
Selby, John H., Major	Cornell University
Shanor, Chas. K., Lt.	Camp Upton
Shawhan, Rexin C., Lt.	Coast Defense of Boston
Schimmelpgennig, Robt. D., Lt.	Post Hospital, Plattsburg Barracks
Schneider, Henry K., Lt.	Walter Reed General Hospital
Simpson, Harry M., Lt.	Louisville, Ky.
Sprague, F. A., Capt.	Edgewood Arsenal, Md.
Startz, Irving S., Lt.	Fort Oglethorpe
Stewart, John D., Lt.	Ft. Des Moines
Stewart, Wm. H., Major	Fort McPherson, General Hospital No. 6
Sullivan, Michael F., Lt.	Camp Greenleaf, Ga.
Swanberg, Harold, Lt.	General Hospital No. 3
Sybenga, J. J., Lt.	Cornell Medical College
Taylor, F. W. Howard, Lt.	Camp McClellan
Thomas, Ray B., Lt.	General Hospital No. 17
Thompson, J. C., Lt.	Army Medical School
Townsend, Leroy S., Capt.	Fort Ontario
Tripler, Samuel, Lt.	Base Hospital, Camp Eustis
Turner, L. L., Lt.	General Hospital 24
Valensi, Albert, Lt.	" " 21
Wang, Stanley L., Lt.	Camp Greenleaf, Ga.
Watters, Chas., Capt.	" Logan
Weitzner, Samuel F., Lt.	" Meade
West, Frederic B., Lt.	" Greene, N. C.
West, Theodore S., Capt.	" Wheeler, Ga.
Wheat, A. F., Major	Oglethorpe
Wheatley, Frank E., Lt.	General Hospital No. 21
Wheatley, Louis F., Capt.	Camp Greenleaf, Ga.
Whisler, Frederick M., Capt.	Corpus Christi, Texas
Wilkins, Henry F., Lt.	Base Hospital, Ft. Logan H. Roots
Wise, Francis R., Lt.	Camp Wadsworth
Wolfe, H. D., Lt.	" Upton
Wolfe, J. R. V., Capt.	General Hospital No. 18, Waynesville, N. C.
Young, Daniel W., Capt.	Letterman General Hospital, California
Zimmerman, Harold	

TRANSLATIONS & ABSTRACTS

LABORDE, SIMONE. Le Radium et les Blessures de Guerre. (*Revue Interalliée*, 1918.)

Dr. Simone Laborde has applied radium to many different kinds of vicious scars with good results. The cicatrices were largely due to retractions, and adhesions. Application of radium for 20 hours about five times, with an interval of two weeks, very frequently brought total return of mobility and relaxation of adherent tendons and muscles, and restored the function to compressed nerves. About two-thirds of the cases of painful neuritis were ameliorated or cured, and the same number of cases of atonic, slowly-healing wounds were cured with dressings saturated with radio-active water. Painful stumps were also very often benefited by treatments of rather long duration.

PEER LUND.

MASMONTEIL, F. Roentgen Examination of the Diaphysial Fractures of the Forearm. (*J. de Radio. et d'électrol.*, No. 12, December, 1917.)

For examining a patient roentgenoscopically or roentgenographically in case of diaphysial fractures of the forearm, one must not be satisfied to examine merely the seat of fracture but the whole of the forearm including the upper and lower radio-ulnar articulation where often one may find important injuries. The roentgenograms must be taken with the forearm in two different positions. The principal one is the antero-posterior position with the forearm supinated. The other one, less important, a lateral view.

PEER LUND.

LEVINE, ISAAC AND JOSEPH, BARNETT. Morphologic Appearance of Cancer Clinically Cured by Radium and Roentgen Ray. (*J. Am. M. Ass.*, No. 13, Sept. 29, 1917.)

A clinical cure of cancer can be considered to be the gross destruction of the primary tumor with disappearance of symptoms and the well-being continued for a sufficiently marked time to preclude the spontaneous remission of the disease. The clinical effect of radiation on malignant tumors was always thought to be accompanied by distinct morphologic changes, destruction of the tumor cells and connective tissue formation. The authors claim, after the microscopical observations and experimental studies, that while during the treatment with radium and *x*-rays the rays do not produce any marked change in the morphological appearance of the tumor, the proliferating power and thus also the clinical malignancy of the cancer cells are very deeply impaired. The proliferating power is markedly inhibited and there is produced a sterilization of the cancer cells. The degeneration of the cells and the connective tissue formation are the later stages in the life cycle of the cancer cells. In an untreated cell of a malignant tumor there is a rejuvenation before this later phase of life is reached, but the radiation arrests this proliferation and the natural degeneration occurs. Therefore the morphologic appearance of a radiated cell is not an absolute criterion of therapeutic effect of the rays. Only positive findings are indicative of results, while negative findings do not preclude that there was some influence caused by the rays.

PEER LUND.

PAUCHET, VICTOR. Dilatation of the Duodenum. (*Arch. d'électric. méd.*, No. 428, May, 1918.)

In the course of abdominal operations, the surgeon often finds a dilatation of the duodenum, coincident with an intestinal kink of the last loop of the ileum and a dilatation of this loop.

In the *x*-ray picture the duodenum appears enlarged; in spite of intense peristaltic movement it empties only with difficulty. The last loop of the small intestine empties only after fifteen to thirty hours. This duodenal and iliac stasis appear to be due to a ptosis of the cæcum and the ileum, forming a kink (Arbuthnot Lane) with a traction on the mesentery and the mesentery vessels. As a result of this, there is a stasis and chronic toxemia and a general infection of the portal system.

The medical treatment consists of an abdominal support and abdominal exercises, and so forth. The surgical treatment would be ileosigmoidostomy with or without right cholostomy.

The patient with a chronic obstruction of the duodenum gets an acute dilatation of the stomach and duodenum with very grave symptoms. The acidosis of the stomach provokes a continuous aerophagia with acute distention of the stomach. This distention by accentuating the mesenteric kink causes duodenal blockage.

BARKER, LEWELLYS F. Oral Sepsis and the Digestive Apparatus. (*South. M. J.*, Vol. XI, No. 7, July, 1918, p. 481.)

The forms of oral sepsis most often responsible for disorders of the digestive apparatus consist of two groups: (1) alveolar infections secondary to diseases of the dental pulp; and (2) gingivitis, pyorrhea alveolaris, and infections around impacted and unerupted teeth. The first group includes: (a) acute peri-odontitis (apical, interradial or lateral) in which the tooth becomes tender, especially at night, and feels longer and looser than it should, so that mastication becomes painful, often resulting in an acute alveolar abscess (gum boil), in an alveolar parulis (or flat swelling under the periosteum), or in a chronic alveolar abscess, with a sinus, of the gum or face; and (b) proliferative peri-odontitis, that leads to granulons (apical, interradial or lateral), usually starting as a result of the devitalization of a tooth and imperfect treatment of the root canal, and causing no symptoms referable to the tooth or gums recognizable by the patient. It was the application of roentgenological technique to dead teeth that revealed the frequency of this condition, which is referred to often as "blind abscess." Any person who has devitalized teeth in his mouth does well to have them *x*-rayed at intervals in order that a proliferating peri-odontitis shall not be overlooked. From the second group of oral infections much toxic matter may be directly absorbed. Inspection of the mouth, palpation of the gums, and roentgenographic examinations make the diagnosis clear.

The varieties of disturbance of the digestive apparatus associated with these forms of oral sepsis are (1) gastritis and gastroenteritis, (2) achylia gastrica, (3) pylorospasm (concerning which the evidence is not yet extensive), and (4) a toxic hepatopathy. It seems probable that some cases of (5) gastric and duodenal ulcer are secondary to oral sepsis. There is still doubt as to whether (6) appendicitis and (7) cholecystitis may occasionally be due to metastatic infection from a primary oral focus.

Let us be somewhat sceptical and not attribute everything to oral sepsis. Yet we know that bad teeth may do much harm by causing trouble in other parts of the body. I do not think a tooth should be sacrificed unless the indications are clear for its removal. On the other hand, do not try to save teeth that can not be made aseptic, for there is real danger that they may injure the rest of the body.

BARKER, LEWELLYS F. Discussion—Symposium on Oral Sepsis. (*South. M. J., Nashville*, Vol. XI, Sept., 1918, p. 614.)

There is no point that is more generally overlooked by the general practitioner at present than the significance of oral sepsis in relation to other diseases. Cases of arthritis and cases of anemia have gone on for months without any attention at all having been paid to the teeth, and in which an examination of the teeth revealed serious sepsis of the mouth. Until the primary focus of infection has been removed but little result may be achieved by therapeutic efforts.

The renal complications of oral sepsis should have been emphasized. Nephritis is certainly not infrequently secondary to oral sepsis. It seems likely that a considerable amount of the arterial sclerosis and hypertension that develops in middle and later life has a relation to chronic oral sepsis. There are certain run-down conditions that turn out to be due to unrecognized oral sepsis.

In children the primary focus is more often in the tonsils or in the adenoids; in older people, more often in the teeth, the paranasal sinuses, or the gall-bladder.

Oral infection without distinct symptoms should be especially looked after, and the infection removed to prevent development of more serious disease. This is more important than to recognize oral infection after the heart valves have become involved or the joints have become crippled by arthritis; prevention is easier than cure.

With reference to their personal dental work, physicians should not permit the devitalizing of a tooth so that a bridge or crown may be put on, for now it is possible to attach bridges to live teeth.

B. DARLING.

GRAVES, M. L. Oral Sepsis and the Anemias. (*South. M. J.*, Vol. XI, No. 7, July, 1918, p. 484.)

Anemia constitutes but one of the clinical manifestations of infection, whether it originates in the mouth or elsewhere. It is a fairly constant symptom in all the grave infections and, to a more moderate extent, in the less severe ones. Cases, absolutely negative after careful examination and presenting mouth infections of a very bad character, have impressed me with the growing probability of the oral cavity being at least a nidus for or the portal of entrance of the infective agent producing pernicious anemia. Anemias of the secondary type, including streptococcal and pneumococcal and other infections of the blood, resulting in anemias, have often shown the mouth as the probable cause of infection.

I am not aware that the pathology or pathogenesis of leukemia has ever been determined, but considering the two principal etiological suggestions of (a) malignant neoplasm and (b) infection, my personal observation inclines me to look to agencies of infection as the probable cause. It may be urged that other sources are quite possible, but one cannot ignore the open sesame of the mouth infection.

GIBBES, J. HEYWARD. Oral Sepsis and Arthritis. (*South. M. J., Nashville*, Vol. XI, July, 1918, p. 489.)

Pyogenic bacteria are responsible for many forms of endocarditis, for gastric and intestinal inflammations, for the group of joint diseases, formerly designated as arthritis deformans, etc. A streptococcus or other type of infecting agent has been substituted for "uric acid diathesis." The treatment is now etiologic instead of symptomatic, and it is possible to prevent the development of many disabling diseases.

The mouth is the portal by which the largest number of disease germs enter the body.

There is a great group of diseases which can be properly investigated only through the *x*-ray. Films should be made of all devitalized teeth. *X*-ray inspection should also be made of apparently sound teeth as the viability of a tooth does not mean that the tissues about the neck of the root are normal. Proper interpretation of dental roentgenograms is a delicate question, and discrimination is required in deciding for or against the sacrifice of a tooth. Medical men are inclined to be radical in indicating extraction but dentists are inclined to treat teeth unquestionably diseased.

The roentgen ray often discloses a degree of infection and alveolar destruction that would pass unsuspected upon inspection alone. The roentgen ray is the method of precision in gingival and dental examinations.

But no one portal of entry for infecting microörganisms should be allowed to obscure the importance of investigating all possible sources of infection.

BECK, HARVEY G. The Relation of Chronic Infection to Thyroid Deficiency. (*South. M. J., Nashville*, Vol. XI, July, 1918, p. 492.)

Glandular insufficiency is of common occurrence and frequently overlooked and chronic infections are almost invariably associated with glandular syndromes. That acute or chronic infectious processes have an etiological significance in either hyper- or hypo-functioning of the thyroid has been demonstrated clinically. The removal of chronically inflamed tonsils, gall-bladders, and appendices has been advocated as the first step in the treatment of Graves' disease, and frequently results in cure. Rheumatism shows a special tendency to involvement of the thyroid. Thyroid intoxication occurs in young women patients with focal infection in the form of alveolar abscesses, tonsillitis, and sinusitis; thyroid enlargement has been observed coincident with chronic gingivitis. In one case goitre symptoms were relieved after removal of abscessed teeth; in another, goitre, arthritis, and pyorrhea followed tonsillectomy, from which recovery followed treatment for the pyorrhea and extraction of an abscessed incisor.

The frequency with which oral sepsis and inflammation of the gall-bladder and appendix are associated indicates more than a casual relation. The administration of thyroid usually relieves the symptoms referable to thyroid deficiency but does not remove the source. Surgical measures must frequently be employed. With a clinical picture of hypothyroidism, the possibility of chronic infection should be suspected and diligent search made for foci, especially in the mouth, gall-bladder, and appendix.

B. DARLING.

WILSON, ROBERT, JR. Discussion Symposium on Oral Sepsis. (*South. M. J., Nashville*, Vol. XI, Sept., 1918, p. 610.)

Perhaps it is due to the enthusiasm of those of us who have been too hasty in advising the extraction of teeth which should not have been extracted, that many members of both the medical and the dental professions have been slow in accepting the truth about oral sepsis. The importance of curetting the cavity after the extraction of a tooth should be emphasized. The physician, himself, in consultation with the dentist and the roentgenologist should reach a decision as to whether or not the tooth should be extracted.

RICHARDSON, EDWARD H. Discussion—Symposium on Oral Sepsis. (*South. M. J., Nashville*, Vol. XI, Sept., 1918, p. 611.)

Chronic infections have to be considered seriously in their relationship to the disturbances of the endocrine glands. There are certain possible explanations as to how a chronic infection may bring about a thyroid deficiency. One is that there is an absorption of toxins from the focus of infection (with a specific injurious effect on the parenchyma of the thyroid). A second possible explanation is that the chronic absorption of toxins from the focus of infection might bring about chronic inhibition of the thyroid gland through the central nervous system. A third possible explanation might be that chronic foci of infection disturb the normal balance which is believed to exist between the different units of the endocrine system, and there may be inhibition of the thyroid gland through hyperactivity of another unit. A fourth explanation is that it is a metabolic phenomenon.

GRANGER, A. Improved Model of the Granger Localizer. (*Journal of Roentgenology*, Vol. I, No. 2, August, 1918, p. 127.)

Granger's device belongs to the general type of the pierced-screen, parallax combination, in which, briefly, a transparent—to *x*-ray—base, *A*, placed underneath the patient, contains an easily recognized opening, *B*, and carries an upright standard, *C*. On this standard is carried a pointer, *D*, and a fluorescent screen which has in its center a pencil hole, *E*. In the general type the screen is adjustable up and down, and the pointer both up and down and to and fro. *B* and *E* are in a vertical line and *D* is in a plane with that line.

In Granger's device, upright *C* is attached to an independent base which may be easily attached to or removed from the base *A*. *A* has a scale with zero at *B*, and *C* has a scale with zero at *A*. *D* and *E* are adjustable in the vertical plane through sleeves. The opening, *B*, is one inch square and the base, *A*, carries a grid of six $^1/_8$-inch brass bars. Three of these are imbedded in the base from end to end, two forming the right and left margins of the opening, *B*, while the third bisects it. The three cross bars of the grid are so placed that two form the near and far margins of the opening, *B*, and again the third bar bisects it. The grid therefore occupies the opening, *B*, while the three long bars extend to either side.

The center of *B* is marked by a $^1/_{32}$-inch hole through the center of the grid. The shadow cast is that of a six-bar grid, the three uprights of which extend from the near and far sides. The instrument is used on any transparent—to *x*-ray—top table, having a protected movable tube underneath.

In use base, *A*, is adjusted underneath the patient so that the shadow of the foreign body overlies the center of the shadow of the grid. The screen is then adjusted so that the pencil hole, *E*, also overlies the foreign-body shadow, and the skin is marked at this point. The shadow of pointer, *D*, will be seen to overlie or approximate the shadow of the middle upright of the grid. The tube is now shifted so that the foreign-body shadow follows the middle cross bar of the grid from its middle to its intersection with one of the outer bars—say the right. Now, with the tube remaining fixed, pointer *D* is moved up or down until its shadow overlies or approximates this outer bar as it did the middle one in the first position. The pointer is now advanced to produce a second skin mark and the required measurements are read off on the scales. In other parallax instruments one has to shift pointer and tube until a position is found where the shadow of the pointer indicates the shadow of the foreign body with any tube position. With Granger's improvement, this operation is reduced to one easily determined motion. Rapidity and accuracy are promoted.

D. R. BOWEN.

E. W. Caldwell